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Part III

Environmental Protection Agency

Standards of Performance for New Stationary Sources; Emissions Limitation of Volatile Organic Compounds From Gasoline Tank Truck Loading Racks at Bulk Gasoline Terminals

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

[AD-FRL-1634-4]

Standards of Performance for New Stationary Sources; Bulk Gasoline Terminals

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed Rule and Notice of Public Hearing.

SUMMARY: The proposed standards would limit emissions of volatile organic compounds (VOC) from new, modified, and reconstructed gasoline tank truck loading racks at bulk gasoline terminals.

The proposed standards implement Secion 111 of the Clean Air Act and are based on the Administrator's determination that bulk gasoline terminals contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare. The intent is to require new, modified, and reconstructed bulk gasoline terminals to use the best technological system of continuous emission reduction, considering costs, non-air quality health, and environmental and energy impacts which has been adequately demonstrated.

A public hearing will be held to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning the proposed standards.

DATES: *Comments.* Comments must be received on or before February 17, 1981.

Public Hearing. A public hearing will be held on January 21, 1981 (about 30 days after proposal) beginning at 9 a.m.

Request to Speak at Hearing. Persons wishing to present oral testimony must contact EPA by January 14, 1981 (1 week before hearing).

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Central Docket Section (A-130), Attention: Docket Number A-79-52, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460.

Public Hearing. The public hearing will be held at E.R.C. Auditorium, R.T.P., North Carolina 27711. Persons wishing to present oral testimony should notify Mrs. Naomi Dur Kee, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5271.

Background Information Document. The Background Information Document (BID) for the proposed standards may be obtained from the U.S. EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone (919) 541-2777. Please refer to "Bulk Gasoline Terminals—Background Information for Proposed Standards," EPA-450/3-80-038a.

Docket. Docket No. A-79-52, containing supporting information used in developing the proposed standards, is available for public inspection and copying between 8:00 a.m. and 4:00 p.m., Monday through Friday, at EPA's Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, SW, Washington, D.C. 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Ms. Susan R. Wyatt, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5477.

SUPPLEMENTARY INFORMATION: A Background Information Document has been prepared that contains information on tank truck loading operations at bulk gasoline terminals; the available control technologies for VOC emissions; and analysis of the environmental, energy, economic, and inflationary impacts of regulatory alternatives. The information contained in this document is summarized in this preamble. All references used for the information contained in the preamble can be found in this document.

Proposed Standards

The proposed standards would limit volatile organic compound (VOC) emissions from new, modified, and reconstructed gasoline tank truck loading racks at bulk gasoline terminals. Specifically, the proposed standards would require the installation of vapor collection equipment at the terminal for the purpose of collecting the VOC emissions displaced during loading of liquid product into gasoline trank trucks, and would limit these emissions from the collection system to 35 milligrams of VOCs per liter of gasoline loaded.

Additionally, a terminal owner or operator would be required to restrict gasoline tank truck loadings to those tank trucks which had passed an annual vapor-tight test. Written documentation in the form of tank truck test results would be kept on file at the bulk gasoline terminal in a permanent form available for inspection.

Five new Reference Methods are proposed with these standards to measure vapor processor outlet VOC mass emissions, and to test gasoline delivery tanks for vapor tightness. Methods 2A and 2B measure gas flow rates in pipes and small ducts, and in vapor incinerator exhausts, respectively. Methods 25A and 25B measure VOC concentration by two detection methods. Method 27 is a pressure/vacuum (vapor-tight) test for gasoline delivery tanks. Terminal vapor handling equipment would be monitored for leaks prior to each performance test using Method 21, which has been proposed with Standards of Performance for VOC Fugitive Emission Sources in the Synthetic Organic Chemicals Manufacturing Industry.

Summary of Environmental, Energy, and Economic Impacts

The proposed standards would reduce the projected nationwide 1985 VOC emissions from affected facilities by about 6,600 megagrams per year, or 70 percent.

Emissions of carbon monoxide and oxides of nitrogen from thermal oxidation systems would total up to 10 Mg/yr and 4 Mg/yr, respectively, in the fifth year of the standards. This represents a relatively small air pollution impact.

Water is not used as a direct control medium by any of the available control techniques. Existing separation and handling systems could accommodate the small amount of wastewater discharged by some types of control processors. The proposed standards would have a negligible impact on water quality.

Because all of the VOC emissions are incinerated or returned to storage as liquid product, there would be no direct solid waste impacts under the proposed standards. Some solid waste would be generated indirectly due to disposal of activated carbon from carbon adsorption units after the useful life of the carbon had expired. Even the worst case situation would produce minimal impacts on solid waste.

The proposed standards would have negligible impacts on noise, space requirements, and availability of resources.

Because all of the available vapor processors, except the thermal oxidizer, recover energy in the form of gasoline, the proposed standards would result in a net energy savings equivalent to approximately 9 million liters (2.4 million gallons) of gasoline per year in the fifth year of the standards.

The proposed standards would result in a total nationwide capital cost for VOC control during the first five years after the effective date of the standards

of about $25.3 million. The proposed standards would also result in a total nationwide annualized cost in the fifth year of about $4.3 million.

Under the worst case situation, the maximum increase in the retail price of gasoline resulting from the proposed standards would be less than 0.6 percent due to bulk terminals and less than 0.7 percent due to the independent tank truck industry.

Rationale

Selection of Source

The EPA Priority List (40 CFR 60.16, 44 FR 49222, August 21, 1979) lists, in order of priority for standards development, various source categories in terms of quantities of nationwide pollutant emissions, the mobility and competitive nature of each source category, and the extent to which each pollutant endangers health and welfare. The Priority List reflects the Administrator's determination that emissions from the listed source categories contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare, and is intended to identify major source categories for which standards of performance are to be promulgated. Petroleum Transportation and Marketing is included as Number 23 on the Priority List.

Bulk gasoline terminals are an important part of the gasoline delivery chain and are usually the first link between the refinery and the ultimate end-user. There are presently an estimated 1,511 bulk terminals handling gasoline in the U.S. terminals typically receive gasoline from the refinery by pipeline, ship, or barge, store the gasoline in large aboveground tanks, and redistribute the gasoline to smaller facilities in the marketing chain (i.e., bulk plants and service stations). Gasoline is loaded into delivery tank trucks at the terminal loading racks and is transported to the next link in the delivery chain. A typical bulk gasoline terminal has a gasoline throughput of 950,000 liters (250,000 gallons) per day, three loading rack positions for gasoline, and four aboveground tanks for gasoline with a combined storage capacity of 24,000 m^3 (150,000 bbl). Bulk gasoline terminals are normally found in or around urban areas since the demand for gasoline is higher in these locations.

It is estimated that ten new terminals will be built in the next ten years. This relatively small growth rate is a reflection of the small increase in gasoline consumption projected for the next ten years. Current industry trends are toward consolidation of existing terminals rather than the construction of new terminals. Estimates, based upon an industry survey, indicate that there may be as many as 100 modified and reconstructed sources in the next ten years.

Gasoline loading racks at terminals currently contribute approximately 300,000 megagrams per year (Mg/year) of VOC emissions, which is approximately 2 percent of the total nationwide VOC emissions. After full implementation of proposed State regulations on bulk gasoline terminals, expected by 1982, total VOC emissions from loading racks are expected to be reduced to about 140,000 Mg/year.

Selection of Pollutants and Affected Facilities

VOC is the only pollutant which is emitted during the loading of liquid product into tank trucks at bulk gasoline terminals. Consequently, the proposed standards would regulate only VOC emissions from the loading operations at terminals.

Volatile organic compounds are any of the organic compounds that participate in atmospheric photochemcial reactions. Ozone, produced in these reactions, results in a variety of adverse impacts on health and welfare, including impaired respiratory function, eye irritation, necrosis of plant tissue, and deterioration of certain materials, such as rubber. Further information on these effects can be found in the U.S. Environmental Protection Agency (EPA) document entitled "Air Quality Criteria for Ozone and Other Photochemical Oxidants" (EPA–600/8–78–004).

The two major sources of VOC emissions at terminals are the storage tanks and the tank truck loading racks. Storage tanks are currently regulated under Federal standards (40 CFR 60, Subpart Ka—Standards of Performance for Storage Vessels for Petroleum Liquids). Those standards cover storage tank emissions caused by atmospheric changes (breathing losses) and emissions due to filling and emptying the storage tank (working losses). Therefore, storage tanks would not be regulated by these proposed standards.

Loading racks consist of the piping, pumps, meters, and loading arms that are necessary to transfer liquid petroleum products from storage tanks to delivery tank trucks. Emissions from the loading racks are generated during the loading of liquid product into delivery tank trucks when the liquid product being loaded displaces VOC vapors contained in the delivery tanks. These vapors consist of evaporated gasoline components which fill the air space above the liquid product. VOC emissions from the loading operation can vary due to the loading method (splash loading causes more emissions than submerged loading) and due to the VOC concentration of the vapors in the delivery tank truck prior to loading. This VOC concentration can vary significantly depending upon the type of product carried, temperature, pressure, vapor tightness of the delivery tank, and whether vapors were transferred back to the delivery tank when the last load of liquid product was unloaded (vapor balanced).

Loading rack facilities in the bulk terminal industry can vary widely in the types and quantities of products handled. In addition to gasoline, large quantities of fuel oil, diesel, and jet fuel may be handled by a gasoline terminal. The amount of each product handled is due to the different demands for each product in the vicinity of the terminal. VOC emisisons from fuel oil, diesel, and jet fuel are very small compared to those from gasoline. Consequently, only VOC emissions from gasoline would be covered by the proposed standards.

At many terminals, "switch loading" of delivery tank trucks is practiced. Switch loading involves the transport, in a single tank compartment on successive deliveries, of various products in addition to gasoline. Gasoline vapors can be displaced either by incoming gasoline or by any other liquid product when a previous load of gasoline left vapors in the delivery tank. As an example, fuel oil loaded into a tank compartment which had carried gasoline on the previous load would displace gasoline vapors, and thus produce VOC emissions. For the purposes of the proposed standards, the delivery vehicle in both cases is referred to as a "gasoline tank truck."

Because gasoline vapors can be emitted from a tank truck loading a product other than gasoline, switch loading was taken into account in designating the affected facility to be regulated under the proposed standards. Consequently, the proposed standards would affect both the loading of gasoline into delivery tanks and the loading of any liquid product into delivery tanks which contain gasoline vapors. Any delivery tank carrying gasoline on the immediately previous load is assumed to contain gasoline vapors. The costs of controlling switch loading facilities (loading racks) are not significantly greater than the costs to control only gasoline loading racks. Since the same vapor processor is used to control all of the loading racks, the primary additional cost would be for the vapor piping

connecting each loading rack to the main vapor line to the processor. In some cases, a larger, more expensive processor might be specified in order to handle increased vapor flow, but the additional cost would amount to a small percentage of the total cost. Many bulk terminals are already controlling all loading racks which have the potential to displace gasoline vapors.

Since only small quantities of gasoline (less than 2 percent) are delivered by rail cars, vapor controls on these loadings were not investigated, and the proposed standards would apply only to the loading of liquid product into gasoline tank trucks.

For the purposes of the proposed standards, gasoline is defined as any petroleum distillate or petroleum distillate/alcohol blend with a Reid vapor pressure of 27.6 kilopascals (4 pounds per square inch) or greater which is used as a fuel for internal combustion engines. The addition of the distinction for petroleum distillate/alcohol blend in the definition is to include gasohol fuels which have experienced increased consumption in recent months.

Because vapor leakage from the tank trucks being loaded can represent a significant proportion of the total bulk terminal VOC emissions occurring during liquid product loading, the proposed standard has been written to control such vapor leakage as well as emissions from the loading racks. EPS believes that Section 111 would authorize this regulation to take any one of the three alternative forms described below; the Agency solicits comments on all issues associated with each approach.

Under the first approach, the standards would apply only to the bulk terminal. The terminal owner or operator would be required to use vapor collection equipment on loading racks servicing gasoline tank trucks, and to restrict loadings to vapor-tight tank trucks. The affected facility under this approach would include only the loading racks servicing gasoline tank trucks. Operators of gasoline tank trucks wishing to load at the teminal would need compatible loading and vapor recovery equipment, and vapor-tight delivery tanks. This approach would consolidate responsibility for controlling emissions without resulting in an excessive burden for the terminal owner or operator.

Under the second approach, standards would apply directly to both the terminal and the tank trucks. The standards would require the terminal owner or operator to install vapor collection equipment and the tank truck operator to have compatible equipment and vapor-tight tank trucks. Under this appproach, the affected facility would consist of the combination of the loading rack and the truck-mounted tank, with a single standard covering the hybrid loading rack/tank facility. The second approach could result in several owners or operators (of the terminal and of the tank trucks) at the same terminal being regulated under a single standard. This could create enforcement difficulties and problems in determining liability.

The third approach would involve designating two affected facilities, one consisting of the loading racks servicing gasoline tank trucks and the other consisting of the truck-mounted tanks, and applying a separate standard to each facility. It would not be practical to directly regulate gasoline tank trucks under a separate standard because the VOC emissions being regulated occur only during product loading at the terminal, and a situation of two standards regulating the same source of emissions would result. Furthermore, in the case of new tank trucks loading at an existing uncontrolled bulk terminal, only the tank trucks would be regulated, and VOC emissions would be displaced to the atmosphere uncontrolled since the terminal would have no vapor collection or control equipment to process the vapors. Thus, separate standards would not be effective in these circumstances.

After considering the issues involved with each of these approaches to designating the affected facility, the Administrator selected the first approach as the most practical designation. This places direct responsibility under the proposed standards on the owner or operator of the bulk terminal only, eliminates the potential for enforcement problems associated with an impermanent affected facility under the second approach, and eliminates the situation of regulating the same operation with two standards under the third approach.

The selected approach, which considers only the bulk terminal loading racks as the affected facility designation, presents several possibilities. Two potential affected facility designations considered under this approach were (1) each individual loading rack, and (2) the combination of all the loading racks at the terminal which service gasoline tank trucks.

In choosing the affected facility, EPA must decide which piece or group of equipment is the appropriate unit (the "source") for separate emission standards in the particular industrial context involved. The Agency must do this by examining the situation in light of the terms and purpose of Section 111. One major consideration in this examination is that the use of a narrower designation results in bringing replacement equipment under the NSPS sooner. If, for example, an entire plant is designated as the affected facility, no part of the plant would be covered by the standard unless the plant as a whole is "modified" or "reconstructed." If, on the other hand, each piece of equipment is designated as the affected facility, then as each piece is replaced, the replacement piece will be a new source subject to the standard. Since the purpose of Section 111 is to minimize emissions by application of the best demonstrated control technology at all new and modified sources (considering cost, other health and evnironmental effects, and energy requirements), there is a presumption that a narrower designation of the affected facility is proper. This ensures that new emission sources within plants will be brought under the coverage of the standards as they are installed. This presumption can be overcome, however, if the Agency concludes either that a) a broader designation of the affected facility would result in greater emissions reduction than would a narrow designation; or b) the other relevant statutory factors (technical feasibility, cost, energy, and other environmental impacts) point to a broader designation. The application of these factors is discussed below.

While selection of a narrower designation of affected facility generally results in greater emissions reduction by earlier coverage of replacement equipment, it appears that a broader designation would result in greater emissions reduction in the bulk gasoline terminal industry. Replacement of existing racks in not expected to occur to any great extent, because properly maintained racks do not generally require replacement. In other words, the isolated replacement of a single rack due to deterioration of that rack is expected to occur rarely. Rather, EPA projects that terminals will concentrate on additions of new racks to sets of existing racks rather than replacement of existing racks. EPA further projects that if replacement does occur, it will involve a major change in the rack system (such as conversion from top to bottom loading) and will involve most or all of the racks at the terminal rather than just one rack. The reasons that a total racks affected facility designation is expected to result in greater emission reduction than a single rack affected facility designation, in the situations described above, are explained in the following paragraphs.

A modification, under 40 CFR 60.14, is any physical or operational change to an existing facility which produces a net increase in the emission rate from that facility. If a new rack were added to a terminal it would be an affected facility under a single rack designation, and only that rack would be covered. Under a total racks designation, the addition of a single new rack could result in a modification, in which case all of the racks would become an affected facility, resulting in greater emission reduction under this designation, Even if the addition of the new rack did not result in a modification because there was no increase in emissions (due to partial control, for example), the total racks designation would still result in less emissions. This is because the single rack designation would still result in a small incremental emissions increase even if the rack were controlled.

In addition to modification, an existing facility could become reconstructed, under 40 CFR 60.15, if the fixed capital cost of replacing components at that facility exceeded 50 percent of the cost of a comparable entirely new facility. Under a single rack designation, this cost figure could be attained sooner for a given rack than it would under a total racks designation, since total replacement cost for parts for a single rack would be less than for all the racks, and 50 percent of the cost for a single new rack would be less than 50 percent of the total cost for all new racks. However, under a total racks designation, all the racks at a terminal could become affected facilities if the conversion cost exceeded 50 percent of the cost needed to build all new racks; although more racks would have to be converted to attain this cost, more racks could eventually be covered sooner than they would be under a single rack designation. Multiplerack conversion projects of this type are the most likely type of replacement at bulk terminals.

Whether the total racks designation would actually result in more emission reduction than the single rack designation is somewhat uncertain. The designation which would result in the most emission reduction depends on decisions made by a terminal owner or operator when replacing racks or adding new racks to the terminal. It is difficult to accurately forecast what these decisions will be. For example, under the single rack designation, even if only one rack had to be controlled, the terminal owner or operator may elect to control all racks instead of one rack, since it is common industry practice to control all racks with one control device. If this occurred, the single rack designation could result in control of all racks just as would the total racks designation.

In summary, considering that the addition of new racks and the multiple replacement of racks are expected to be more likely occurrences in this industry than single rack replacement, and the fact that more racks would come under the standards under the total racks designation than under the single rack designation in these cases, it is projected that the total racks designation would result in the greatest emission reduction. However, as stated previously, this depends on decisions made by a terminal owner or operator at the time of construction.

After projecting that the total racks designation would result in the greatest emission reduction, the reasonableness of the cost of this designation was then evaluated. For terminals which do not already have control devices (most new and existing terminals in attainment areas), examination of the cost data has indicated that the affected facility designation of each individual rack would generally result in lower capital costs than the designation of all the loading racks. However, the net annualized cost would be lower for the total racks approach, assuming that the terminal elected to use a control system other than thermal oxidation, because of the greater liquid recovery cost credits associated with controlling all of the loading racks. For example, at an affected terminal the capital cost to install controls on one loading rack (assuming 380,000 liters/day throughput) would be about $295,000. This cost includes the vapor processing system, installation, and piping. Under a total racks designation, the capital cost to install controls on all loading racks (assuming 1,900,000 liters/day throughput) would be about $345,000. Annualized costs, which include capital charges, labor, maintenance, utilities, and liquid recovery credits, indicate as much as an $80,000 per year difference in favor of the total racks controls (a net annualized cost of about $40,000 for a single rack designation, and a net annualized cost savings of $40,000 for a total racks designation). The major reason for this favorable annualized cost, as stated earlier, is the greater recovery cost credits associated with the controls on all of the racks. Based on this analysis, it was concluded that for terminals in attainment areas the costs which would result from a total racks designation would be reasonable, and would in fact be less expensive on an annualized basis provided that the control system used recovered gasoline from the collected vapors. Systems which recover gasoline are expected to comprise the majority of the systems which would be installed under the NSPS.

Another consideration regarding costs for terminals in attainment areas is that most tank trucks serving bulk terminals in attainment areas would not be equipped for vapor recovery under State regulations. In order to load at a controlled loading rack, a tank truck would have to be equipped with a vapor collection system to route gasoline vapors to the terminal's control system. Besides having to retrofit vapor recovery equipment, some tank trucks would also have to convert to bottom loading from top loading, if the terminal switched to bottom loading in the course of installing vapor control equipment. In addition, a vapor tightness requirement could be in effect for tank trucks loading at such a rack. However, under a single rack designation, a terminal could end up with a mix of controlled racks and uncontrolled racks. In this case, tank trucks would probably load at the uncontrolled racks so that the cost of retrofitting could be avoided. Thus, a terminal owner or operator considering a conversion of one or more racks, which would result in those racks becoming affected facilities, likely would either be deterred from making any changes or would convert all of the racks and all of his tank trucks in order to prevent this situation from occurring. The result of this conversion would be the same as under a total racks designation.

For terminals which already have control devices (the majority being existing terminals in non-attainment areas), capital and annualized costs could both be lower for a total racks designation of the affected facility. For example, the case of an existing terminal which is modified by adding a loading rack and increasing emissions was analyzed. If the limits of the standard were more stringent than those under which the existing control device was operating, then depending on whether the device could meet the more stringent limit, the terminal owner or operator might have to make an expenditure in order to comply with the new limits. Under a one rack designation for the affected facility, only the new rack would be required to meet the limits of the standard. If a separate control system was installed for the new rack, capital costs could be about $295,000 and annualized costs could be about $70,000 per year. Under the total racks designation of the affected facility, both the existing racks and the new rack

might be required to meet the limits of the standard under the modification provisions. One option would be to install an add-on system to the existing control device if that control device could not meet the limits of the standard. The capital cost for this approach could be about $100,000 and the net annualized cost could be about $20,000 per year more than the annualized cost of operating the original system. Another option would be to replace the existing control device with a new device which could meet the limits of the standard. The capital cost for this could be about $200,000 and the incremental net annualized cost could amount to $50,000 per year. A third option for terminal operators whose control device could be altered to achieve a lower emission limit would be to upgrade the existing device through design or operational changes. While the cost for this approach would vary in individual cases, it would be considerably less than the cost for either of the first two options. Finally, any presently installed control device which was capable of complying with the limits of a more stringent standard would not have to be altered. The operator's decision to select any of these options would depend on such factors as the terminal's financial position and the type, age, condition, and control efficiency of the existing control device. Based on this analysis, it was concluded that for terminals in non-attainment areas, regardless of which option the terminal operator selected, the costs incurred under a total racks designation would be reasonable, and in fact any of the options discussed would be less expensive than the costs under a one rack designation.

In addition to the emission reduction and cost considerations discussed above, the single rack designation has technical complications. Performance testing of this affected facility would be difficult at terminals which already have some means of vapor control installed (estimated to include about 70 percent of the existing terminals). If one rack were newly installed or altered in such a way as to become an affected facility under modification or reconstruction provisions (40 CFR 60.14 and 60.15) and were required to meet a more stringent emission limit, the new rack could require controls different from the remainder of the loading equipment. Since the emissions from all of the racks are typically routed to the single vapor processor, it would be impossible to distinguish the vapor processor outlet emissions originating from only the new loading rack. If an existing control device were unable to meet a more stringent emission limit, a bulk terminal operator could either install a separate vapor collection system and processor for the new rack, or replace or upgrade the existing control device. The latter approach is identical to what a total racks designation of the affected facility would accomplish.

The foregoing discussion indicates that, based on the assumptions made, the total racks designation would result in the greatest emission reduction. Furthermore, the total racks designation would be the most consistent with the industry practice of using one control device for all racks at a terminal. The total racks designation, by causing all collected vapors to be routed to a single vapor processor, would result in the less expensive approach to achieving the requirements of the proposed standards, and the costs would be reasonable. Performance testing of this type of affected facility would be straightforward because all loading racks would be subject to the same standards. Consequently, after considering the emission reduction, technical, and cost impacts associated with each possible designation, the Administrator selected the combination of all the loading racks as the affected facility.

Comments are specifically invited concerning the selection of the affected facility. In particular, comments are requested on the question of whether selection of the total racks designation would in fact result in greater emissions reduction than would selection of the one rack designation, and the economic impact of this selection on existing terminals. Comments are requested on the factors considered and also on any additional factors which should be considered. Any comments submitted to the Administrator on this issue should contain specific information and data pertinent to an evaluation of the magnitude and severity of its impact and suggested alternative courses of action that would avoid this impact.

Selection of Basis of Proposed Standards

Control Technology. Control systems currently being used at terminals consist of two main elements, the vapor collection system and the vapor processing system (or vapor processor). All of the vapor collection systems used at terminals are somewhat similar. The air-vapor mixture displaced during the loading of the delivery tank is contained and routed through vapor piping on the tank truck to the terminal vapor collection piping. The terminal vapor collection system, in turn, routes the air-vapor mixture through piping to the vapor processing equipment. Knock-out tanks are commonly utilized between the loading racks and the vapor processor to remove liquid from the transfer lines before it reaches the vapor processor. Liquid can enter the line due to overfilling the delivery tank, entrainment of liquid droplets from the loading operation, or condensation of vapor into liquid. Vapor holding tanks are also used in some vapor collection systems. Vapor holding tanks are used to store a designated volume of air-vapor mixture and then release it to the processor to process the vapors on a batch basis. Fluctuations in VOC concentration and air-vapor mixture flow rate are minimized by using vapor holders.

Several vapor processing techniques were evaluated by EPA. These control techniques included carbon absorption (CA), thermal oxidation, (TO), refrigeration (REF), compression-refrigeration-adsorption (CRA), compression-refrigeration-condensation (CRC), and lean oil absorption (LOA). These six techniques represent all of the control methodologies commonly employed at bulk terminals. At least one system utilizing each of these control technologies was tested in an EPA-sponsored test program conducted between 1973 and 1978. The test procedure used was the procedure outlined in the draft bulk gasoline terminal Control Techniques Guideline (CTG) document, "Control of Hydrocarbons from Tank Truck Gasoline Loading Terminals," dated May 15, 1977. This test procedure is similar to the procedures in the proposed standards and in Reference Methods 2A, 2B, 25A, and 25B. Although the emission measurement methods were the same as the proposed Reference Methods 2A, 2B, 25A, and 25B, the test procedure varied slightly, in that the test period was longer than the period required in the proposed standards. This difference is discussed in Appendix D of the Background Information Document, and would not affect the achievability of the standard.

The test data considered in evaluating the six control technologies mentioned earlier represent terminals ranging in gasoline throughput from 190,000 liters per day (50,000 gal/day) to 5,700,000 liters per day (1,500,000 gal/day). Twenty-two tests were performed, totaling 61 days of testing. In addition, several tests performed by others using the same procedures were considered in evaluating the control technologies. Thus, these data are considered representative of the conditions at a

wide range of terminal sizes and are an adequate basis for an evaluation of the best systems of continuous emission reduction.

Tank trucks have been demonstrated to be major sources of vapor leakage during product loading operations at bulk terminals. Vapor leakage can vary significantly from one tank to another. The larger the tank truck leakage, the smaller the volume of air-vapor mixture that enters the vapor collection system. To evaluate the results of the vapor control system tests, the results from all of the tests were calculated on a comparable no-leak basis. Mass emissions, in the form of milligrams of VOC per liter of gasoline loaded, were used to compare the test results on a common basis. These units were used to be consistent with the units utilized in the test reports.

Carbon adsorption systems use beds of activated carbon to adsorb gasoline vapors from the air-vapor mixture. CA systems at terminals typically consist of two carbon beds. One bed actively adsorbs the vapors while the other bed is being regenerated. After a set period of time, the active bed is regenerated, with the air-vapor flow re-routed to the opposite bed.

Three EPA tests, consisting of nine days of testing, were performed on two carbon adsorption systems which incorporated vacuum regeneration assisted by warm air purge. The daily average emissions from these systems ranged from 1.8 milligrams of VOC per liter of gasoline loaded (mg/liter) to 11.0 mg/liter. Two days of testing were not included in evaluating the system because of unit maladjustment and testing irregularities. On one test day, the bed switching timer was set incorrectly, leading to excessive loading on one carbon bed. On one day of another test, two tank trucks were purposely loaded simultaneously, causing vapor loading to exceed the design capacity of the CA system. This was done in order to determine the performance limit of the system. Further details are contained in Appendix C of the Background Information Document. Control unit efficiencies on the remaining seven days ranged from 98.6 percent to 99.6 percent. One of the systems tested included a vapor holder in its design.

One test was performed in 1979 by the California Air Resources Board on a carbon adsorption system using vacuum regeneration. Mass emissions measured at the system exhaust were not specified exactly, but were reported to be less than 12 mg/liter.

Thermal oxidizer systems do not recover any product. Instead, the gasoline vapors are oxidized in a burner chamber. Many TO systems use vapor holders to store air-vapor mixture from the loading racks so that the system can process VOC vapors at a relatively constant concentration and flow.

Tests were performed on four thermal oxidizer control systems. Two of the control systems incorporated vapor holders, while two systems operated on an on-demand basis. Emissions from the thermal oxidizer systems ranged from 1.4 mg/liter to 107 mg/liter over the four systems tested. Control efficiencies varied from 86.6 percent to 99.8 percent. Even though there was a wide variability in the test results, all systems tested appeared to be operating properly. The two thermal oxidizer systems incorporating a vapor holder achieved an average VOC emission rate of 13.3 mg/liter, while the two systems without vapor holders averaged 46.4 mg/liter.

Refrigeration systems, as with the remainder of the systems to be discussed, recover gasoline vapors from the loading operation in the form of a liquid product. In the REF system, air-vapor mixture from the loading racks is routed to a condensation chamber and passed over a series of cooling coils. Temperatures in the condensation section can be as low as −115°F. The gasoline vapors condense, with some water vapor in the air, and are separated in a gasoline/water separator.

Six refrigeration type vapor processing systems were tested in the EPA program, totaling 17 days of testing. The emissions in one test were unusually high compared to those from other REF tests. Problems with the test equipment and with the refrigeration system itself led to the high emissions in this test. Since these test results were not considered representative of the system's performance, data from this test were not included in the analysis of the REF system. In another test, serious leakage in the vapor collection system prevented almost half of the air-vapor mixture displaced from tank trucks from reaching the refrigeration system. Data from this test were also not included in the REF system performance evaluation. Appendix C of the Background Information Document contains further details on these tests. The daily average results from the four remaining tests ranged from 31.1 mg/liter to 103 mg/liter, and indicated a control efficiency ranging from 77.1 percent to 94.6 percent. During two of these four tests, the refrigeration system was not cooling the vapors to the temperature for which the sytem was designed. Cooling section temperatures were approximately 40°F warmer than the design temperature — 60°F instead of −100°F). Emission rates adjusted for system leakage from these two tests averaged approximately 52 mg/liter. It is not known how much lower the emission rate would have been if the design temperature of the cooling sections had been maintained, but improved emission rates are expected for these systems if design temperatures are maintained. Most of the EPA testing performed since 1974 on REF systems involved systems which use chilled methylene chloride "brine" to cool the condenser section. Many newer systems use direct expansion of refrigerant for cooling, and recent tests indicate that the new systems may be capable of improved performance and reliability when compared to the older systems. Three tests performed in 1978 and 1979 by the California Air Resources Board on the latest model refrigeration systems measured outlet VOC mass emission rates of 48 mg/liter, 36 mg/liter, and 5 mg/liter.

In compression-refrigeration-absorption systems, the air-vapor mixture from the loading racks is first saturated to bring the concentration of the gasoline vapors above the explosive range and is then stored in a vapor holding tank. When the volume limit is achieved, the air-vapor mixture is routed to the CRA processing unit. The air-vapor mixture is first compressed and then passed to a cooler-condenser section where some liquid is condensed and recovered. The remaining mixture is sent to an absorption section where the gasoline vapors are absorbed in chilled gasoline.

Six CRA-type vapor processing systems were tested by EPA, totaling 16 days of testing. All of the systems tested incorporated vapor holders in the system design. Average daily processor outlet emission rates ranged from 41.5 mg/liter to 91.0 mg/liter. Processor efficiences ranged from 61.4 percent to 94.8 percent.

Compression-refrigeration-condensation systems are similar in operation to the CRC systems. The air-vapor mixture is saturated and then stored in a vapor holding tank. The air-vapor mixture is compressed and any condensed liquid is collected. The remaining mixture then passes through a series of refrigerated condenser sections before exiting to the atmosphere.

Two CRC vapor processing systems were tested, totaling five days of testing. One system tested had serious leakage problems from the vapor holder. No method was available to estimate the leakage so the outlet emissions could not be adjusted for comparison to the other tests. Processor efficiency was

also not calculated because the vapor leakage took place after the inlet sampling location. The two test days with complete results indicated emission rates of 48.4 mg/liter and 55.9 mg/liter, and processor efficiencies of 89.0 percent and 91.5 percent.

The final system evaluated was the lean oil absorption system. The LOA system is basically an absorption system where the gasoline vapors, which are predominantly lighter molecular weight hydrocarbons, are absorbed in a "lean oil," which is lean in light ends. The air-vapor mixture is introduced into the bottom of the absorption column and passes countercurrent to lean oil, generated on site, which is sprayed from the top of the tower. The recovered liquid is returned to storage.

One lean oil absorber processing system was tested, consisting of three days of testing. The daily average emission rate ranged from 73.0 mg/liter to 130.0 mg/liter with processing efficiency ranging from 74.1 percent to 85.9 percent.

Most of the systems evaluated were designed and installed to meet an 80 mg/liter (or about 90 percent efficiency) standard as required in many SIPs. The test data, however, reflect the potential of most of the systems to achieve a higher control efficiency.

As mentioned earlier, vapor leakage from tank trucks can be a major source of VOC emissions during terminal loading operations. As the gasoline or other liquid product is being loaded, most of the displaced vapors are collected and contained in the vapor collection system. However, some vapors may leak out of the hatch covers, pressure-vacuum (P–V) vents, and other vapor containment components on the tank truck to the atmosphere uncontrolled. Since, in this case, only part of the displaced vapor volume is collected and controlled, the overall efficiency of the vapor control system is reduced. Vapor tightness requirements on the delivery tank would reduce the fugitive emissions problem at the loading racks. No vapor tightness requirements were in effect at any of the terminals tested in the EPA control system test program. Vapor leakage for individual loadings varied from 0 to 100 percent. The average vapor leakage was approximately 30 percent.

To control these emissions, a maintenance program would be necessary. Such a program would consist of inspecting gaskets and seals for wear or crackiing, hatch covers for warpage, and P–V vents to ensure that they seat properly. The maintenance program would involve repairing or replacing any items in the tank truck vapor containment equipment that might allow vapors to escape. The ability of the delivery tank tc maintain vapor tightness is dependent upon the loading method, maintenance program, and the type of service to which the tank is exposed. In separate EPA-sponsored program (EPA Report No. EPA–450/3–79–018), delivery tank trucks were tested in an area where a vapor tightness program was implemented. in this area, delivery tank trucks were required to pass an annual certification test which verified the vapor tightness of the tank. In this program, the annual average vapor leakage from the tested delivery tank trucks was reduced to about 10 percent.

Emissions through leaking tank trucks can be increased by improperly designed loading rack vapor collection systems. For example, if two trucks are loading simultaneously, vapor collected from one truck may pass through the vapor piping to another rack and escape through a non-vapor-tight truck. The leaking tank represents the path of least resistance to the atmosphere for the vapors in the loading rack collection system. This has been observed in several terminal tests. This problem can be eliminated by the installation of check valves or similar devices in the vapor collection system which would not allow vapors to pass from one loading rack to another. This design has been used at several terminals.

Regulatory Alternatives. Regulatory alternatives were developed which represent technically feasible levels of control for reducing VOC emissions from bulk gasoline terminals. The units of milligrams per liter (mg/liter) were used to compare the vapor processing systems tested and were, therefore, used to distinguish between emission reductions achiveable by each of the alternatives.

Based on review of the technical support data, four regulatory alternatives were selected. Under Alternative I no standards would be developed. Instead, the State Implementation Plans (SIP's) would be relied upon to control VOC emissions from bulk gasoline terminals. SIP regulations for VOC generally require controls only in the areas which do not meet National Ambient Air Quality Standards for ozone (non-attainment areas). However, 17 States are expected to require SIP controls statewide by 1982. A typical SIP regulation for gasoline loading at bulk terminals would require the routing of vapors to a vapor processing system and would limit the emission rate from the processor outlet to 80 mg/liter. The emission rate of 80 mg/liter is roughly equivalent to 90 percent control efficiency. The typical SIP would also contain a requirement for gasoline delivery tanks to pass an annual vapor-tight test to minimize fugitive vapor losses at the loading terminal. It was estimated that SIP regulations on tank truck loadings and vapor tightness would affect approximately 70 percent of new and existing terminals by 1982.

The remaining three alternatives reflect two basic levels of control for vapor processing equipment installed at terminals, but represent three levels of overall emission reduction. Each of these three alternatives would require that affected facilities be equipped with vapor collection equipment. Emission limits would be met using vapor processing equipment similar to the systems tested by EPA. Emission test results indicate that most of the vapor processing systems which are now being installed to meet existing emission limits could, in fact, meet a more stringent standard.

Alternative II would require the SIP emission limit of 80 mg/liter and would also require that liquid product loadings into gasoline tank trucks be restricted to trucks which were vapor-tight. Emission reductions from the baseline would be experienced under Alternative II since all new, modified, or reconstructed terminals not covered by the SIPs would be regulated by Alternative II. These terminals would include those in attainment areas not regulated by SIPs. The test data indicate that the carbon absorption, thermal oxidation, refrigeration, CRA, and CRC vapor processing systems could meet the emission limits of Alternative II.

Alternative III would set a VOC emission limit based on 35 mg/liter as determined from the available test data. This alternative would have no specific tank truck vapor-tight requirements and would rely on the SIPs to control tank truck fugitive emissions in non-attainment areas. Tank truck fugitive emissions in attainment areas would remain uncontrolled under Alternative III. Inspection of the test data revealed that the carbon adsorption system and thermal oxidation system with vapor holder were roughly equivalent, giving the most consistent results in reducing VOC emissions. Emission rates from carbon adsorption systems ranged from 1.8 to 11.0 mg/liter, averaging 5.9 mg/liter. Thermal oxidizer systems using a vapor holder produced emissions ranging from 1.4 to 29.4 mg/liter, for an average of 13.3 mg/liter. Although average emissions from carbon

adsorption systems were slightly lower, the cost analysis indicated that the thermal oxidation system using a vapor holder is the most cost-effective system for small terminals.

This is important since about half of the affected facilities are expected to be in the smallest model plant size.

The highest adjusted daily emission rate from the applicable tests on carbon adsorption and thermal oxidizer with vapor holder systems was approximately 29 mg/liter. This adjusted emission rate represents the calculated rate which would have occurred in a vapor-tight collection system, based on actual measured emissions and an adjustment factor based on measurements of tank truck vapor leakage during testing. In order to allow a small margin above the highest adjusted emission rate from the tested systems, a level of 35 mg/liter was selected as the emission limit for the regulatory alternative. It appears that refrigeration, as well as carbon adsorption and thermal oxidation, has the capability to achieve this limit, although some operational or design modifications might be required for specific systems.

Alternative IV is similar to Alternative III in that it would limit the vapor collection system emissions to 35 mg/liter. This emission limit is based on the same control technologies as in Alternative III. In addition, Alternative IV would require that liquid product loadings into gasoline tank trucks be restricted to vapor-tight trucks.

Model plants were developed for new, modified, and reconstructed terminals in order to analyze and compare the environmental, energy, and economic impacts of each regulatory alternative. Four model plants were selected to represent the cross-section of daily gasoline throughputs found in the bulk gasoline terminal industry. Gasoline throughputs selected for comparison and analysis were 380,000 liters/day (100,000 gallons/day), 950,000 liters/day (250,000 gallons/day), 1,900,000 liters/day (500,000 gallons/day), and 3,800,000 liters/day (1,000,000 gallons/day). New terminals are best represented by the three larger model plant sizes while existing terminals are best represented by the three smaller model plant sizes.

Impacts of Regulatory Alternatives. Under Alternative I, in the absence of additional standards of performance, there would be no VOC emission reduction beyond the reductions due to the SIPs, which will result in a 1982 baseline VOC emission level of 140,000 megagrams per year (Mg/year).

Under Alternative II, the 1982 baseline level would be reduced by 5,750 Mg/year by 1985. This represents a reduction of about 60 percent, from 9,150 Mg/year to 3,410 Mg/year, in the VOC emissions from all new, modified, and reconstructed terminals.

Under Alternative III, nationwide VOC emissions would be reduced by 4,510 Mg/year by 1985. Emissions from affected terminals would be reduced by about 50 percent, from 9,150 Mg/year to 4,650 Mg/year by 1985. The lower emission reduction of Alternative III when compared to Alternative II illustrates the significance of tank truck vapor leakage. Even though processor outlet emissions under Alternative III would be reduced from 80 mg/liter to 35 mg/liter, the absence of a requirement that terminals restrict loadings of gasoline tank trucks to vapor-tight trucks more than offsets the additional VOC reduction.

Under Alternative IV, nationwide VOC emissions by 1985 would decrease by 6,620 Mg/year. The reduction in VOC emissions from affected terminals during this period would be about 70 percent, from 9,150 Mg/year to 2,540 Mg/year.

The regulatory alternatives would apply to all new, modified, or reconstructed terminals but would affect terminals in non-attainment areas differently than terminals in attainment areas. New and existing terminals in non-attainment areas would be regulated by SIP requirements and would therefore have some type of vapor control system already installed. Most terminals in attainment areas would not be controlled by SIPs and would experience the greatest effects of the regulatory alternatives. Terminals in attainment areas would experience different effects depending upon the type of loading currently used at existing terminals or that which would have been used by a new terminal in the absence of additional standards. There are two basic methods by which delivery tanks can be loaded at bulk terminals, top loaded through the hatchways on top of the tanks, or bottom loaded through adapters at the bottom of the tanks. Top splash loading involves inserting a nozzle into the hatchway and splashing the incoming product onto the surface of the product in the tank. Attaching a fixed or extensible downspout to the loading arm allows product to be introduced below the liquid surface (submerged loading). Bottom loading can also be considered a form of submerged loading. Generally, top splash loading results in greater VOC emissions than submerged loading. Thus, greater emission reductions would be achieved under any of the regulatory alternatives when controlling top splash loading terminals compared to terminals using submerged loading.

VOC emissions for model plants would vary for each alternative. Under Alternative II, new, modified, or reconstructed terminals in non-attainment areas would experience no VOC emissions reduction. The emission limits for existing terminals in non-attainment areas under SIP regulations are identical to the limits under Alternative II. In an attainment area, under Alternative II, a terminal with a gasoline throughput of 950,000 liters per day which previously used submerged loading would experience a VOC emission reduction of 137 Mg/year (from 194 Mg/yr to 57 Mg/yr). For the same throughput terminal which previously used top splash loading, a VOC emission reduction of 408 Mg/yr (from 465 Mg/yr to 57 Mg/yr) would be experienced under Alternative II.

Under Alternative III, a 950,000 liter/day terminal in a non-attainment area would experience an VOC emission reduction of 19 Mg/yr (from 57 Mg/yr to 38 Mg/yr). For a submerged loading terminal in an attainment area, a VOC emission reduction of 87 Mg/yr (from 194 Mg/yr to 107 Mg/yr) would be experienced. If splash loading were used prior to control, this same terminal would experience a VOC emission reduction of 358 Mg/yr (from 465 Mg/yr to 107 Mg/yr) under Alternative III.

For a 950,000 liter/day terminal in a non-attainment area, emission reductions under Alternative IV would be the same as the emission reduction achieved under Alternative III, 19 Mg/yr (from 57 Mg/yr to 38 Mg/yr). For a 950,000 liter/day terminal in an attainment area, emission reductions achieved under Alternative IV would be 156 Mg/yr (from 194 Mg/yr to 38 Mg/yr) for a terminal which used submerged loading and 427 Mg/yr (from 465 Mg/yr to 38 Mg/yr) for a terminal which previously used splash loading.

Thermal oxidation systems emit carbon monoxide (CO) and oxides of nitrogen (NO_x) during the combustion of VOC vapors. A thermal oxidation system at a 950,000 liter/day terminal would emit approximately 0.8 Mg/yr of CO and 0.3 Mg/yr of NO_x. A worst case situation would be one in which 25 percent of the 50 modified or reconstructed terminals by 1985 were to install thermal oxidation systems, and all of these facilities had gasoline throughputs of about 950,000 liters per day. In this case, nationwide CO emissions would increase by 10 Mg/yr and nationwide NO_x emissions would increase by 4 Mg/yr. For both of these pollutants, the emission increases

represent a small adverse nationwide air pollution impact.

Impacts on water pollution from any of the alternatives considered would be negligible, since none of the control systems considered uses water as a collection medium. Carbon adsorption systems using steam in the regeneration mode would have the greatest impact on water pollution. All of the steam would be condensed and any gasoline present in the condensed liquid would be separated in the terminal's gasoline/water separator. However, there are no steam-regenerated carbon adsorption systems currently installed at bulk terminals, and the vacuum-regenerated systems currently in use will represent the primary carbon adsorption technology at bulk terminals into the foreseeable future. All other systems which chill or condense the air-vapor mixture use a gasoline/water separator integrated into their design, and discharge a small amount of condensed water vapor. The impacts on water pollution are the same for each of the regulatory alternatives because essentially the same control equipment is being assumed for each alternative.

Because all of the VOC emissions are incinerated or returned to storage as liquid product, there would be no direct solid waste impacts under the regulatory alternatives. Some solid waste could be generated indirectly due to disposal of activated carbon from carbon adsorption units after the useful life of the carbon had expired. The worst case for solid waste impact would occur if all affected facilities were to use carbon adsorption units for control and had to dispose of the activated carbon every 10 years. This would result in only about 50,000 kilograms (55 tons) of solid waste annually. Even in this worst case, the impact of the alternatives on solid waste would be negligible. In practice, not all affected facilities are expected to choose carbon adsorption for control, and in many cases the carbon may last longer than 10 years or may be transported off-site for regeneration and reuse.

The energy impacts were derived by assuming that all VOC emissions reduction was recovered as liquid product, and that one liter of this liquid product was equivalent to one liter of gasoline. It is assumed for a vapor-tight vapor collection system, that no part of the recovered product is lost to the atmosphere on the way to the storage tank. In addition, although the VOC liquid may not have the exact composition of gasoline, the liquid is returned to the storage tank where each liter becomes absorbed and is available for loading into tank trucks as gasoline. The energy required to operate the vapor processing equipment was subtracted to determine the net energy impact of each alternative.

A net energy savings would result from each of the regulatory alternatives. A net energy savings for each alternative is projected even though it is assumed that as many as half of the small new, modified, or reconstructed terminals may install thermal oxidizer systems, which do not recover energy and have a small net energy loss. Alternative II would accomplish a net fuel savings of 8 million liters (2.1 million gallons) of gasoline per year in the fifth year of the standard. Alternative III would recover 6 million liters (1.6 million gallons) of gasoline per year in the fifth year.

Because it results in the greatest recovery of VOC, Alternative IV would result in the greatest net energy savings. Alternative IV would recover 9 million liters (2.4 million gallons) of gasoline per year in the fifth year of the standard.

A net energy savings would result from each of the model plant sizes for any of the vapor control systems except thermal oxidizer systems. Energy savings would range from an average of 144,000 liters per year (38,000 gallons per year) of gasoline for the smallest model plant (gasoline throughput 380,000 liters/day) to an average of 1,540,000 liters per year (407,000 gallons per year) of gasoline for the largest model plant (gasoline throughput 3,800,000 liters/day). A net energy loss ranging from 2,600 liters of gasoline per year for the small model plants to 22,000 liters of gasoline per year for the largest model plants would result through the use of thermal oxidizer systems.

The total capital and annualized costs to the bulk gasoline terminal industry were determined for each regulatory alternative. Capital costs include the purchase and installation of vapor collection and processing systems, retrofit of tank trucks to bottom loading and vapor recovery configurations, and conversion of top loading racks to bottom loading. Annualized costs include capital charges, utilities, maintenance and repairs, and routine operating labor. Alternatives II and IV would require an additional cost to perform an annual vapor-tight test and subsequent repairs on tank trucks.

In addition to the incremental costs incurred by bulk terminals under the regulatory alternatives, there would be a cost impact on owners of the "for-hire" tank trucks operating at terminals. For-hire tank trucks are those trucks owned by independent companies, which transport products from bulk terminals to other distribution points. For-hire trucks are estimated to constitute about 70 percent of the tank trucks at bulk terminals. Companies operating for-hire tank trucks would have to install compatible loading and vapor recovery equipment on their tank trucks which serve affected bulk terminals. Since several configurations of adapters are possible, the regulation would require compatible equipment to ensure that tank truck and terminal vapor collection systems could be connected during product loading. All trucks not already having bottom loading and vapor recovery provisions would be retrofitted with this equipment, and thus there would be a cost impact on these companies as a result of the proposed standards. It is estimated that 390, or 2 percent, of the estimated 18,000 for-hire tank trucks would be affected in the first five years. Approximately 85 of these would have to convert to botton loading and incorporate vapor recovery provisions, at $6,400 per tank truck, and 305 would have to add vapor recovery provisions only, at $2,400 per tank truck. Annualized costs to the for-hire tank truck industry would include the cost of maintaining the vapor recovery equipment and, under Alternatives II and IV, the cost of performing an annual vapor-tight test on each gasoline tank truck.

The total capital cost to the bulk gasoline terminal industry for the installed vapor control equipment necessary to meet Alternative II on the 55 new, modified, or reconstructed terminals expected through the first five years of the standard would be approximately $23.0 million. The terminal industry annualized cost in 1985 would be $3.3 million. The total capital cost to the for-hire tank truck industry through the first five years would be approximately $1.3 million. Annualized cost to the tank truck industry in 1985 would total approximately $0.7 million, due to incremental maintenance and testing requirements. The overall annualized cost-effectiveness in 1985 expected under Alternative II would be $696/Mg ($632/ton) of VOC controlled.

Under Alternative III, the total capital cost for vapor control equipment necessary through the first five years would be approximately $24.0 million. The industry annualized cost in 1985 would be $4.1 million. The total capital cost to the for-hire tank truck industry through 1985 would be about $1.3 million, and the annualized cost in 1985 would total about $0.6 million. The industry annualized cost-effectiveness in 1985 expected under Alternative III

would be $1,042/Mg ($946/ton) of VOC controlled.

Under Alternative IV, the total capital cost to the terminal industry for vapor control equipment necessary through the first five years of the standard would be approximately $24.0 million. The terminal industry annualized cost in 1985 would be $3.6 million. As in Alternative II, the total capital cost to the for-hire tank truck industry through 1985 would be about $1.3 million, and the annualized cost in 1985 would total about $0.7 million. The overall annualized cost-effectiveness in 1985 expected under Alternative IV would be $650/Mg (590/ton) of VOC controlled.

A mix of current control technologies being installed to achieve 80 mg/liter was used to establish the capital cost figures for Alternative II. Three of the four technologies used could, in fact, meet an emission limit of 35 mg/liter. These three technologies were then used to establish the capital costs for Alternatives III and IV. Because the costs of all the control technologies considered are similar and because much the same equipment was used to establish the capital costs for each alternative, the resultant capital costs for Alternatives II, III, and IV are similar To meet the emission limits of any of the alternatives, the vapors from tank trucks would have to be collected and routed to the terminal collection system. Therefore, the costs for tank truck retrofitting would be the same for each alternative. The differences in net annualized cost among the alternatives result from differing product recovery cost credits at affected terminals, and the inclusion of tank truck vapor-tight requirements under Alternatives II and IV.

For Alternative II, cost assessments were performed on the carbon adsorption, thermal oxidizer, refrigeration and compression-refrigeration-absorption vapor processing systems for each model plant size. Operating costs for the compression-refrigeration-condensation system are considered comparable to the CRA system. The lean oil absorption system was not included in the analysis because the test data indicated that the system tested would not be able to meet the requirements of Alternative II. For Alternatives III and IV, cost assessments were performed on the carbon adsorption, thermal oxidation, and refrigeration vapor processing systems only. The test data indicated the inability of the CRA or CRC systems to meet a 35 mg/liter limit. For all of the alternatives, the thermal oxidizer system would be competitive with the other units only at the smaller model plant sizes. All other systems evaluated are comparable when considering annualized costs.

A secondary, or add-on, vapor processor could be chosen by the owner or operator of an existing SIP-controlled facility which became an affected facility under the proposed standards. Add-on systems, primarily carbon adsorption and thermal oxidation, have been used at bulk terminals to increase the control efficiency of existing processing systems. Selecting an add-on system to process part of the vapors would be an option to replacing the existing system with a more efficient system designed to handle the entire load. The add-on option would require operating and maintaining two processors, whereas the option of replacing the system entirely means that expenses would be incurred for just one processor. The incremental net annualized cost for the add-on option is virtually independent of terminal size, amounting to approximately $20,000 per year for an add-on carbon adsorption system, and $45,000 per year for an add-on thermal oxidizer system. The incremental net annualized cost of a replacement carbon adsorption system would average approximately $37,400 for any terminal size. Due to the loss of gasoline recovery cost credits, a thermal oxidizer system replacing a vapor recovery system would cost from $43,000 per year to $300,000 per year more than the costs incurred due to the original system. As a result, add-on or replacement thermal oxidizer systems are likely to be selected for use only at the smallest bulk terminals.

An economic analysis performed on each of the regulatory alternatives investigated impacts for new terminals and for modified or reconstructed terminals. New terminals constructed in previously regulated (non-attainment) areas will incur no additional costs as a result of any of the regulatory alternatives because the collection and processing systems being installed to meet SIP requirements are essentially identical to those systems which would be considered under the regulatory alternatives. New terminals in attainment areas would incur varying control costs depending on their size and type of loading. Control costs would not vary significantly among the regulatory alternatives, although the improved product recovery cost credits under Alternative IV lead to the lowest net annualized cost of any alternative. Industry information indicates that no new 380,000 liter/day bulk terminals are planned in the first five years of the proposed standards, because the potential rate of return on smaller terminals is not sufficient to encourage their growth. Terminals in the 950,000 liter/day size category are considered marginally profitable, even without additional control costs. Therefore, only one new terminal of this size is expected to be constructed in an attainment area in the first five years of standards. The two largest model plant sizes, 1,900,000 and 3,800,000 liters/day, are considered attractive investment possibilities, and one new 1,900,000 liter/day terminal is expected to be constructed in an attainment area in the first five years. The construction of these two terminals should not be hindered under any of the alternatives. The 950,000 liter/day terminal would have to pass through most of the control costs to remain a reasonable investment. The necessary degree of cost pass-through appears possible.

Approximately 50 existing bulk terminals are expected to be modified or reconstructed in the five year period covered by this assessment, with 30 of these being in attainment areas. The affected terminals in attainment areas would be likely to experience the impact of installing a complete new vapor collection and processing system where none existed previously. The remaining 30 affected terminals in non-attainment areas would experience a lesser impact because a system to satisfy SIP requirements would probably already be in place. Such a system would satisfy the requirements of Alternative II, but may require upgrading or partial replacement under Alternative III or IV.

Existing terminals of the smallest model plant size (380,000 liters/day) would have to pass through essentially all of the control costs in order to maintain an acceptable rate of return under any regulatory alternative. Existing top loaded 950,000 liter/day terminals in attainment areas would be in a similar situation because they would experience the full impact of converting the loading racks to bottom loading and installing vapor collection and processing systems. It is estimated that 25 of the former case and two of the latter case will occur in the first five years of the proposed standards. In general, full cost pass-through would be unlikely due to competition from other existing terminals and from consumer pressure as indicated by current conservation patterns. However, it is likely that most of the control costs will be able to be passed through, allowing most of the 50 modified or reconstructed terminals to experience acceptable post-control returns on investment. Capital

availability would not be adversely affected by any of the regulatory alternatives. The larger terminals should not encounter any difficulty in meeting the control costs resulting from modifications or reconstructions under any alternative. Terminals in non-attainment areas which replace, upgrade, or add onto an existing control system should also be able to maintain an acceptable return on investment. It should be noted that the control costs under any regulatory alternative are similar to those being borne by a large number of terminals as a result of State VOC regulations.

The current trend toward the consolidation of existing facilities of marginal profitability can be expected to continue under the proposed standards, but the analysis does not indicate any additional closures. The cost pass-through analyses for both new and existing terminals indicate that maximum price increases of less than 0.6 percent would result from any regulatory alternative. It should be noted that this increase would not affect nationwide gasoline prices, but represents a worst case situation within the bulk terminal industry due to complete cost pass-through.

The regulatory alternatives would affect the independent tank truck industry with minor impacts. The profitability of the firms in the industry would not be impacted significantly since regulatory cost absorption would be minimal. Most of the regulatory costs would be passed through to the consumer, causing a maximum increase in retail gasoline prices of less than 0.07 percent for any of the alternatives. It should be noted that this increase would not affect nationwide gasoline prices, but represents a worst case situation within the independent tank truck industry due to complete cost pass-through. Additionally, no closures or dislocations of tank truck firms are expected to result from any of the regulatory alternatives.

Section 111 of the Clean Air Act requires that standards of performance be based on the degree of emission reduction which the Administrator judges to be achievable through application of the best technological system of continuous emission reduction, considering costs, non-air quality health and environmental impacts, and energy requirements, which has been adequately demonstrated. Therefore, in selecting the basis of the proposed standards, the Administrator first examined Alternative IV, which would achieve the greatest reduction in VOC emissions. This alternative would result in a net energy savings of approximately 9 million liters (2.4 million gallons) of gasoline in the fifth year of the standard, which is more than any other alternative. Water and solid waste impacts are essentially negligible under this alternative. Both total capital and net annualized costs to the bulk terminal and for-hire tank truck industries are not excessive under Alternative IV. Small bulk terminals, which would bear the greatest economic impact, would be likely to be able to pass through most of the control costs in order to remain viable. Even the product price increases on the order of 1 percent which could occur if full cost pass-through were possible for terminals are considered reasonable. The price increases due to costs incurred by for-hire tank truck firms would be the same for any alternative. Finally, test data indicate that systems have been demonstrated that can achieve the emission limitation required by this alternative. After consideration of these factors, the Administrator selected Alternative IV as the basis for the proposed standards. It is noted that Alternative IV would achieve a greater VOC emission reduction at less annualized cost than Alternative III.

Selection of Format of Proposed Standards

Section 111 of the Clean Air Act requires the promulgation of standards of performance, establishing allowable emission limitations for a category of stationary sources, whenever it is feasible to promulgate and enforce standards in such terms. Standards of performance are considered not feasible to promulgate or enforce when either (1) a pollutant or pollutants cannot be emitted through a conveyance designed and constructed to emit or capture such pollutant, or (2) the application of measurement methodology to a particular class of sources is not practicable due to technological or economic limitations. If the Administrator judges that it is not feasible to prescribe or enforce a standard of performance, Section 111(h) allows the promulgation of a design, equipment, work practice, or operational standard, or combination of these, which reflects the best technological system of continuous emission reduction (taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impact and energy requirements) which has been adequately demonstrated.

As discussed earlier, VOC emissions at tank truck loading racks are generated when the incoming product displaces air-vapor mixture from the truck-mounted tanks. At an uncontrolled loading rack, the entire quantity of mixture is emitted directly to the atmosphere through open hatch covers or vents. The vapor control systems currently being used at bulk gasoline terminals collect the air-vapor mixture displaced from tank trucks and route the mixture to a vapor processing system. The mixture is conveyed to the processor through vapor collection systems installed on the tank trucks and on the bulk terminal's loading rack system. Even in controlled systems, VOC emissions may occur from the loading operation due to vapor leakage from closed gasoline tank trucks during product loading. These VOC leakage emissions originate at various points on the tank, such as leaking pressure-vacuum vents and defective hatch covers and seals. Due to the fugitive nature of these emissions, it is not feasible to collect the escaping vapors and route them through a conveyance. Since tank leakage measurements at the loading racks do not provide a quantitative measurement of total VOC concentration, flow rate, or mass emissions, an enclosure around a loading tank truck would be necessary in order to trap emissions for measurement. An enclosure and conveyance to accomplish this is not technologically or economically practicable. Due to these considerations, the Administrator determined that a standard of performance, in the form of a numerical emission limit, could not be set, and that a work practice standard would be appropriate for controlling tank truck vapor leakage emissions.

Two methods of defining tank truck vapor tightness and regulating leakage emissions under a work practice standard were considered. The first method would require the use of a portable combustible gas detector during product loading to detect leaks. Any measurement in excess of a specified limit would define a leaking tank. However, the terminal owner or operator may not have control over the maintenance of all trucks loading at his terminal. Also, many terminals use automated billing equipment which allows the tank truck driver to load the tank without any interaction with terminal personnel. At these terminals, a requirement that each loading be monitored would represent an excessive burden. For these reasons, the regulatory format requiring leak monitoring of each gasoline tank truck during product loading was not selected by the Administrator.

The second method would require the terminal owner or operator to restrict loadings of gasoline tank trucks to those which had passed an annual vapor-tight test. This test would be a pressure test of the delivery tank itself and would yield a quantitative measure of tank leakage. Test data show that annual testing and subsequent leakage repair can reduce the average annual tank truck emissions from 30 percent before repair to 10 percent of the vapors displaced during product loading. This work practice standard format would consist of a requirement that the owner or operator of an affected facility restrict product loadings of gasoline tank trucks to those for which he possessed documentation that the tank had passed the vapor-tight test within the 12 preceding months. This format would provide some control over leakage emissions and would not impose an excessive burden on bulk terminal owners or operators. No direct requirements would be placed on operators of for-hire tank trucks which load at affected loading racks. Because this format is the most practical means of controlling emissions from tank trucks, it was selected by the Administrator as the format for the work practice standard.

As discussed previously, in order to set a numerical emission limit for the loading operation at regulated loading racks, the total VOC emissions would have to be measurable, so that a comparison with this emission limit could be made. Since the small portion of the displaced vapors which may leak from the tank trucks cannot be quantitatively measured, accurate measurements of total VOC emissions from tank truck loading are not possible. However, the major portion of the displaced vapors can be measured after the vapors are collected at the loading rack. Vapor collection systems typically include the equipment at the loading rack used to contain and route emissions, and generally consist of hoses or arms, manifolding, piping, and check valves. This type of system is consistent with the current state-of-the-art collection systems in use at many existing bulk terminals. Because of its demonstrated control effectiveness, and because it is not possible to set a standard of performance for the total emissions from the loading operation, an equipment standard requiring a vapor collection system at each loading rack was selected by the Administrator as the format for controlling VOC emissions at the loading racks.

If there were leaks in the terminal's vapor collection system, some or all of the displaced vapors would not reach the vapor processor and would escape to the atmosphere uncontrolled. Leak sources can include flanges and other connections, valves, and pressure relief devices (such as those used in vapor holders). Leakage in excess of 80 percent of the displaced vapors has been found in some EPA tests at bulk terminals. In order for control measures to be effective, leakage from the vapor collection and processing equipment must be minimized. Section 111(h)(1) of the Clean Air Act directs the Administrator to include as part of any equipment standards promulgated under § 111(h) "such requirements as will assure the proper maintenance of any such . . . equipment." Periodic visual monitoring of the equipment required by these proposed standards and repair of observed leaks would minimize VOC leakage without imposing an unreasonable burden on terminal owners and operators. Therefore, the proposed standards include such an inspection-and-repair requirement aimed at enhancing the effectiveness of the proposed standards.

Because emissions from the vapor collection system can be measured, standards of performance in the form of a numerical emission limit can be applied to the vapor collection system. Several formats for these standards of performance are possible. Three formats considered for limiting emissions from the vapor collection system include a concentration standard, a control efficiency standard, and a mass emissions standard. It is assumed that a vapor processing system would be used under any of these formats to achieve the required emission limit.

A format expressed in terms of concentration would limit the VOC concentration in the exhaust from the vapor processing system. The advantage of the concentration format is that a test method to determine VOC concentration does not require flow measurements. These data are required to convert concentration measurements to mass emission measurements. There are, however, several disadvantages to a concentration format. The test data indicate a variation in exhaust gas flow rates and concentrations among the various systems. Flow rates are high through the thermal oxidizer system, which uses large amounts of combustion air, and are low through the refrigeration and CRA systems, which use no outside air in their operation. In addition, the vacuum regenerated carbon adsorption system uses warm purge air to enhance the desorption. These variations in amount of dilution air would require adjustments to compare the systems on an equal basis. The outlet concentrations also vary from system to system and between similar systems manufactured by different companies. Separate concentration limits might be required for each type of control sytstem at each affected terminal if a concentration format were selected.

Information from the manufacturers and results from the testing program indicate that the control efficiencies of the processing systems are dependent on the inlet concentration to the processor. The test data further indicate that concentrations at the inlet of the processor vary considerably from terminal to terminal. This variation is caused by many factors which can include temperature, pressure, vapor tightness of tank trucks, loading method, and whether vapor balancing of tank trucks is used. Vapor balancing consists of routing the vapors, displaced during loading of the customer tank, back to the delivery tank truck. Because of the many factors which may affect the vapor processor inlet concentration, adjustment calculations to compare all terminals on an equal inlet concentration would be very difficult.

Two forms of a mass standard format were considered. The first of these mass formats was an adjusted mass emission limit. An adjusted limit method estimates the volume of vapor loss due to tank truck leakage and assumes that this vapor loss is controlled by the vapor processor at the same efficiency as that measured during the source test. These estimated "processed" truck leakage emissions are then added to the emissions actually measured at the vapor processor outlet to arrive at the adjusted emission rate. This adjustment method, therefore, calculates the emissions from the tank truck loading operation assuming there is no vapor leakage in the vapor collection system. The adjusted emissions method was used to normalize the test results from all the terminals tested so that all control systems could be compared on an equivalent leak-free basis.

The disadvantages of the adjusted mass emission format include: (1) a complex and expensive test procedure, and (2) the mathematical adjustment of an accurately measured value (actual VOC mass emissions from the processor outlet) to obtain the emission limit. The test procedure required to determine the adjusted limits would be identical to the procedure used in the EPA emission testing program. The test procedure requires three days of testing and requires measurements to be taken at the processor outlet, at the vapor

collection system inlet at the loading rack, and at the tank truck hatches for detection of leaks. This test would typically cost $15,000 to conduct.

The second of the mass formats, a mass standard based upon the vapor processor outlet emissions, would involve a simpler, less expensive, and more straightforward test procedure. The vapor processor outlet test would require measurement of the VOC mass emissions at the processor outley only. The emission test procedure, therefore, would not require any mathematical adjustments of the measured VOC mass emissions. The test procedure would be further simplified by requiring only one day of testing. It is estimated that this type of test would cost from $5,000 to $10,000, depending on the type of processor being tested.

The difference between the processor outlet mass emission format and the adjusted mass emission format is that the variable of fugitive tank truck emissions due to leakage is not taken into account under the outlet mass emissions format. However, since neither approach would actually control the fugitive emissions, additional testing complexity and cost are considered to be unwarranted. Due to these considerations, a mass emission format, based on measurements at the outlet of the vapor processor only, was selected.

Selection of Numerical Emission Limits

As discussed previously in the section entitled "Regulatory Alternatives," the numerical limit for Regulatory Alternative IV, which was selected to represent the performance of the best systems tested by EPA at bulk terminals. Although measured emissions from all types of processing systems are highly variable, two of the control technologies achieved consistently low emissions. Three tests on carbon adsorption systems, and two tests on thermal oxidation systems using a vapor holder to release accumulated vapors to the processor on a batch basis, indicated that these two types of systems represented the best control technology for this application. These two types of control systems were selected to represent the best technological system of continuous emission reduction, as required by Section 111 of the Clean Air Act.

The highest adjusted daily emission rate of 29 mg/liter for these two types of systems led to the selection of 35 mg/liter as the emission limit for the proposed standards. It should be noted that any system capable of achieving this limit would be acceptable. Some of the test data and comments from manufacturers of vapor processors indicate that several types of systems could be designed to achieve an emission limit of 35 mg/liter. Design variables could include equipment sizing, increased utilities consumption, and improved system reliability.

The vapor processors designed for VOC control at bulk gasoline terminals require regular maintenance attention in order to consistently achieve the emission limit for which they are designed. Proper maintenance for these units generally includes frequent (at least daily) visual inspections in order to monitor competent operation, fluid levels, warning lights, pressures, temperatures, presence of leaks, and other miscellaneous items. Manufacturers frequently supply inspection checklists to facilitate these routine checks, and some terminals have developed individual lists for their own use. Most terminals incorporate such inspections into the normal duties of their maintenance personnel, which include routine checks of loading racks, storage tanks, pumps, and other terminal equipment. Of course, the inspections themselves do not maintain the proper operation of vapor processors, but any necessary repairs indicated through atypical readings, sounds, etc., can be implemented rapidly to minimize downtime.

Each type of vapor processor has different maintenance requirements due to varying system size and complexity, types of components, and operating time and sequencing. Refrigeration systems require daily checks of several subsystems and components. Defrost system pump pressure, as well as fluid levels and temperatures, should be checked regularly. Oil levels, pressures, and temperatures in the precooler and refrigeration systems require regular inspection. Liquid recovery meters and condenser coil temperature records on some units indicate the level of performance of the units. Maintenance on carbon adsorption systems includes checks of cycle timing and bed vacuum and temperatures. Elapsed system operation time meters on some systems provide an indication of proper system operation and can indicate maintenance intervals. Maintenance of thermal oxidation systems may include daily observation of the activation sequence and inspection of pilots and burners. Sight ports are generally provided so that the condition of the flame can be observed. Vapor holders in these systems should be frequently inspected for leaks, and the high and low level switches checked for proper operation. All vapor processors are provided with indicator panels to warn of malfunctions, and most have automatic shutdown or interlock systems. These systems provide automatic indication that maintenance attention may be required. The annual costs to maintain vapor processing systems, including routine inspections and the expected typical repair costs, have been considered in determining the cost impact on affected terminals.

The vapor-tight test for gasoline tank trucks, Reference Method 27, would require applying a pressure of 4,500 pascals (450 millimeters of water) to the delivery tank and require that the tank sustain a pressure loss of not more than 750 pascals (75 millimeters of water) in 5 minutes from the initial pressure level. The applied pressure value of 4,500 pascals represents the pressure at which tank P–V vents begin to open to relieve tank pressure. Thus, this value was selected for the test limit used to determine tank vapor tightness. This test has been used successfully in California since 1977. Note that only the pressure test, and not the vacuum test, of Reference Method 27 would be applicable under the proposed standards. Only the pressure test is required because tank truck vapor leakage during product loading occurs only when the delivery tank is under positive pressure (product displacing vapors out of the tank). These limits for the tank truck vapor-tight test represent a vapor containment efficiency of 99 percent after testing. However, the tanks do not remain vapor-tight all year. Leaks can occur in the vapor containment equipment due to wear and tear during loading, lodging of foreign material on valve seats, or equipment shock during over-the-road travel. Tests show that the average annual containment efficiency of leak-tested tanks decreases to about 90 percent.

Back pressure from the vapor collection and processing equipment should not exceed the pressure limit of the tank truck vapor-tight test. If the back pressure exceeds this pressure limit, leaks may occur even from tanks which have passed the vapor-tight test.

Therefore, to eliminate the problem of system back pressure causing leaks in the delivery tanks during loading, the vapor collection and processing systems must be designed so that the system back pressure, measured at the loading rack, will always be less than the pressure limit of the tank truck pressure test. This is accomplished in practice by specifying the proper piping diameter and length, minimizing the number of flow control components such as check valves, and selecting a vapor processor which is properly sized to match the

loading activities at the terminal. Therefore, the proposed standards would require that the terminal's collection and loading systems be designed so that the test pressure limit of 4,500 pascals (450 mm of water) will not be exceeded in the delivery tank during product loading.

The pressure-vacuum (P–V) vents commonly used in bulk terminal vapor collection systems are designed to open to relieve any system pressure which exceeds a predetermined value. These vents should not open at any pressure value which may occur in a normally operating system. Since system back pressure may reach the pressure limit of the tank truck pressure test, the P–V vents must not begin to open at any pressure less than this pressure limit. Vents opening at a lower pressure could unnecessarily allow uncontrolled VOC emissions to escape to the atmosphere. Therefore, the proposed regulation would require that these vents have the capacity to contain the vapors in the system under the operating pressure range of the system.

Modification/Reconstruction Considerations

Modification, as defined in § 60.14 of Chapter I, Title 40, of the Code of Federal Regulations (CFR), occurs when any physical or operational change to an existing facility results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies.

Investigation of the bulk gasoline terminal industry indicated that there are several changes at a bulk terminal which could constitute a modification under § 60.14. The criteria for determination of modification would be applied to the entire affected facility, which is designated as the total of all the loading racks which service gasoline tank trucks. For example, any loading rack conversion resulting in a net increase in the emission rate to the atmosphere from an existing facility could be considered a modification, and the existing facility would become an affected facility. A second example would be a physical change to an existing facility which resulted in increased product throughput. However, according to § 60.14(e)(2), such a change would not be considered a modification unless it required a capital expenditure, as defined in § 60.2. For example, the addition of a new loading position, which would require a capital expenditure, to an existing facility with a resulting increase in throughput and in net emission rate would be considered a modification.

Reconstruction, as defined in § 60.15 of Chapter I, Title 40 of the CFR, occurs when the fixed capital cost of replacement components of an existing facility exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and it is shown that it is technically and economically feasible to meet the applicable standards. The 50 percent capital cost figure for reconstruction is a cumulative value of the replacement components for the existing facility. Upon replacement of components, the Administrator would determine, on a case-by-case basis, whether a reconstruction had taken place and whether the existing facility would become an affected facility under the standards.

As in the case of modification, the determination as to whether reconstruction had taken place would be made by applying the criteria to the entire affected facility, which is designated as the total of all the loading racks which service gasoline tank trucks. Again, investigation of the bulk gasoline terminal industry has indicated certain component repairs and replacements which would be considered under the reconstruction provisions. Top to bottom loading conversions of the loading racks, for example, usually exceed the 50 percent fixed capital cost criterion. If so, these conversions would be reviewed under the reconstruction provisions. The Administrator reviews these conversions on a case-by-case basis and, as specified in § 60.15(f), his decision is based upon the following: (1) the fixed capital costs of the replacement components, (2) the estimated life of the facility, (3) the extent to which the components being replaced cause or contribute to the emissions from the facility, and (4) any economic or technical limitations on compliance with applicable standards of performance which are inherent in the proposed replacements. Considering the above items, the Administrator would then determine if the top to bottom loading conversion would constitute a reconstruction.

Replacement or unscheduled major repairs of such items as loading arms, pumps, or meters may not by themselves exceed the 50 percent replacement cost of a new facility. However, since the 50 percent replacement cost is a cumulative figure, these unscheduled major repairs and replacements would be included in reaching the 50 percent criterion.

Normal maintenance items are not included in this determination of the 50 percent replacement cost. Normal scheduled maintenance items include pump seals, meter calibrations, gaskets and swivels in loading arms, coupler gaskets, and overfill sensor repairs. Items which typically require replacement under a normal maintenance program include vapor hoses and grounding cables at the loading rack.

Selection of Performance Test Methods

The VOC concentrations in the vapor processor exhaust would be determined using either EPA Reference Method 25A or 25B. Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer," applies to the measurement of total gaseous organic concentration of vapors consisting of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic compound) or in terms of organic carbon.

A sample is extracted from the source through a heated sample line and glass fiber filter and routed to a flame ionization analyzer (FIA). Results are reported as concentration equivalents of the calibration gas organic constituent, carbon, or other organic compound.

Method 25B, "Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer," is similar to Method 25A and applies to the measurement of total gaseous organic concentration of vapor consisting primarily of alkanes. The concentration is expressed in terms of propane or in terms of organic carbon. The sample is extracted as described in Method 25A and is analyzed with a nondispersive infrared analyzer (NDIR). Results are reported as propane equivalents or as carbon equivalents.

Volumetric flow rate of the exit gases from the vapor processor outlet would be measured using EPA Reference Method 2A or 2B. Method 2A, "Direct Measurement of Gas Volume Through Pipes and Small Ducts," applies to the measurement of gas flow rates in pipes and small ducts, either in-line or at exhaust positions, within the temperature range of 0 to 50°C. A gas volume meter is used to directly measure gas flow. Temperature and pressure measurements are made to correct the volume to standard conditions.

Method 2B, "Determination of Exhaust Gas Volume Flow Rate from Gasoline Vapor Incinerators," applies to the measurement of exhaust volume flow rate from incinerators that process gasoline vapors consisting generally of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). It is assumed

that the amount of auxiliary fuel is negligible. The incinerator exhause flow rate is determined by carbon balance. Organic carbon concentration and volume flow rate are measured at the incinerator inlet. Organic carbon, carbon dioxide, and carbon monoxide concentrations are measured at the outlet. The ratio of total carbon at the incinerator inlet and outlet is multiplied by the inlet volume flow rate to determine the exhaust flow rate.

Methods 2A, 2B, 25A, and 25B are essentially the same methods used on existing bulk gasoline terminals to establish the majority of the data base used in the development of the proposed standards. The tests conducted to establish the data base used three 8-hour test repetitions to average out environmental effects on the vapor-to-liquid volume (V/L) measurements, because temperature and pressure variations in the vapor collection system can affect the vapor volume measured at the inlet to the processor. These V/L values were used to adjust the measured mass emissions to account for leakage. The proposed test procedures would measure the processor outlet only and do not require any adjustments. However, the owner or operator may adjust the emission results to exclude methane and ethane, which are considered negligibly photochemically reactive and do not appreciably contribute to the formation of ozone, a policy announced in EPA's "Recommended Policy on the Control of Volatile Organic Compounds," 42 FR 35314 (July 8, 1977). No reference methods have been promulgated by EPA for specific measurement of methane and ethane. However, these compounds can be measured by gas chromatographic analysis, or any other method approved by the administrator. Since no V/L measurements are require for adjustment, the proposed test procedures incorporate one 6-hour averaging period. The test period is considered to represent the performance of the vapor processing systems. A minimum of 300,000 liters of gasoline would have to be loaded in order for the test period to be valid. This volume of gasoline represents 7 to 10 truck loadings, which is considered to be the minimum number required to allow system performance to be adequately evaluated. Conducting a performance test using these procedures would cost a facility between $5,000 and $10,000, depending on the type of processor being tested.

At many terminals, switch loading is practiced, as discussed in the section entitled "Selection of Pollutants and Affected Facilities." There are two major types of switch loading of concern with regard to the testing of VOC emissions generated during tank truck loading. First, gasoline may be loaded into a tank which has carred a non-volatile product, such as diesel fuel, on the previous load. This tank would contain essentially no VOC vapors, so the VOC emissions during loading would be negligible. Second, a product such as diesel fuel may be loaded into a tank which has carried gasoline on the previous load. The VOC vapors from the previous load of gasoline would be displaced by the incoming product.

At a particular terminal the tank truck population is static over the short term, and each tank truck operates at just that one terminal. Therefore, the frequency of each of the two types of switch loading discussed above would be about equal, and the quantity of VOC emissions could be accounted for by considering only the volume of gasoline dispensed during a given time period. This approach to determining emissions at a terminal would simplify the test procedure. If the liquid volume of all products dispensed into gasoline tank trucks during the performance test were considered, then the liquid volume not displacing gasoline vapors would have to be subtracted form the total volume loaded in order to correlate the VOC mass emitted with the corresponding liquid volume. This procedure would require that each driver be asked which product was carried on the previous load. Based on the information obtained, only the loadings displacing gasoline vapors would be added to obtain the total volume to be used in the calculations. However, since the accuracy of this information would depend on the knowledge of several individuals who may not know the facts, and because it may require extra test personnel to question the drivers, this procedure is not considered to be the most practical method of conducting the performance test.

The procedure which considers only the volume of gasoline loaded during the test relies on a known quantity which can be obtained directly from dispensing meters, instead of relying on uncertain data. The two cases of switch loading essentially cancel each other in terms of their effects on the test results. Therefore, the proposed standards would require emissions to be calculated in terms of the total volume of gasoline dispensed during the performance test. Since excessive practice of switch loading has the potential to affect the test results by increasing the apparent emission level, especially if there were extra unbalanced instances of nonvolatile product loadings into tanks containing gasoline vapors, it is recommended that switch loading be minimized during the performance test.

If there are leaks in the vapor collection system, part of the displaced vapors will escape to the atmosphere and not be controlled by the vapor processor. In order for the emission limitation from the collection system to be effective, any leakage in the system should be repaired as soon as possible. For this reason, the proposed standards would require that the vapor collection and processing systems, as well as the affected loading racks, be visually inspected for liquid or vapor leaks on a monthly basis. The costs presented for the proposed standards include costs for inspection of the control equipment to ensure proper operation and maintenance. Visual inspections for leaks would be part of these inspections and would impose no costs in addition to those already reported. Such inspections would require perhaps one hour to accomplish, and would not impose an unreasonable burden on a terminal owner or operator. In fact such inspections are already a routine practice at many bulk terminals. Under the proposed regulation, a summary of the findings during the inspections would be required as part of the quarterly written report of excess emissions required by the General Provisions, § 60.7(c). The repair interval, i.e., the length of time allowed between the detection of a leak and repair of the leak, selected for the leak inspection requirement is 15 days. This repair interval would allow effective VOC emission reduction to be maintained, while not being burdensome to the terminal operator.

In addition to the monthly inspection, potential sources of vapor leaks would be monitored immediately prior to a system performance test using EPA Reference Method 21, which applies to determination of VOC leaks from organic liquid and vapor processing equipment. A portable instrument is used to detect VOC leaks from individual sources. All leaks would have to be repaired before the test was conducted. This ensures that the vapor processing system is processing the total flow of air-vapor mixture while the performance of the system is being evaluated.

The terminal operator should accept vapor tightness test documentation only for gasoline delivery tank truck testing conducted according to EPA Reference Method 27, "Determination of Vapor

Tightness of Gasoline Delivery Tanks Using Pressure-Vacuum Test." This method is applicable for the determination of vapor tightness of a gasoline delivery tank which is equipped with vapor collection equipment. The cost to perform this annual test would be about $100, plus an average additional repair cost of $50. Variations on this test method are acceptable only with the approval of the Administrator.

Selection of Monitoring Requirements

There are presently no demonstrated continuous monitoring systems commercially available which monitor vapor processor exhaust VOC emissions in the units of the proposed standard (mg/liter). This monitoring would require measuring not only VOC exhaust concentration, but also exhaust gas volume flow rate, volume of product dispensed, temperature, and pressure. Therefore, continuous monitoring in units of the standard would not be required at this time.

Monitoring equipment is available to monitor the operational variables associated with vapor processing system operation. Monitoring of operations indicates whether the vapor processing system is being properly operated and maintained, and whether the processor is continuously reducing VOC emissions to an acceptable level. The variable which would yield the best indication of system operation is VOC concentration at the processor outlet. Extremely accurate measurements would not be required since the purpose of the monitoring would not be to determine the exact outlet emissions but rather to indicate operational and maintenance practices regarding the vapor processor. Monitors for this type of continuous VOC measurement typically cost about $6,000. To achieve representative VOC concentration measurements at the processor outlet, the concentration monitoring device should be installed in the exhaust vent at least two equivalent stack diameters from the exit point, and protected from any interferences due to wind, weather, or other processes.

For some vapor processing systems, monitoring of a process parameter may yield as accurate an indication of system operation as the exhaust VOC concentration. For example, temperature monitoring in the case of thermal oxidation or refrigeration systems may indicate proper operation and maintenance of these systems. Parameter monitoring equipment would typically cost about $3,000. Because control system design is constantly changing and being upgraded in this industry, all acceptable process parameters for all systems cannot be specified. In general, the regulation allows for substituting the monitoring of vapor processing system process parameters for monitoring of exhaust VOC concentration if it can be demonstrated to the Administator's satisfaction that the value of the process parameter is indicative of proper operation of the processing system and is related to the exhaust VOC content. Monitoring of these parameters would be approved by the Administrator on a case-by-case basis. Continuous monitoring systems which are a part of a vapor processor's design may substitute for the requirement to install a separate system, with the approval of the Administrator.

For any system installed to monitor operations, a recording device must also be installed so that a permanent time record of the measured parameter is produced.

EPA has not yet developed performance specifications for these monitors, but a program is underway to develop these specifications. Consequently, until EPA proposed and promulgated monitor performance specifications, owners and operators subject to the requirement to install a vapor processor continuous monitoring system will not be required to do so.

For purposes of excess emissions reports required under § 60.7(c), the period of time selected as the averaging time is a 6-hour clock period. This time interval was selected to coincide with the time interval specified in the performance test. The VOC concentration or parameter limit for the excess emissions report would be determined during the performance test. After EPA establishes and promulgates monitor performance specifications, the monitoring equipment must be operating during the performance test to establish the average VOC concentration or process parameter value. This average value from the monitoring device becomes the limit for the excess emissions report. The quarterly excess emissions report would indicate the amount of time during periods of vapor processing system operation that the average value of the VOC concentration or process parameter value exceeded the average value of the parameter established during the performance test. It is possible that each installation may have a different monitoring limit.

Impacts of Reporting Requirements

The proposed standards for bulk gasoline terminals would require the terminal operator to keep on file documentation that all gasoline delivery tank trucks loading at the terminal had passed an annual vapor-tight test performed according to Method 27. The documentation would include the name of the tester, the test location and date, and the test results. These records would be kept on file at the terminal in a permanent form available for inspection, and would be updated at least once per year to reflect current information. The other type of report required under the proposed standards would be a summary report reflecting the findings on the monthly leak inspection. The preparation and filing of this report would represent only a modest increase in a bulk terminal's reporting requirements. These reports would be submitted quarterly with each report of excess emissions required under the General Provisions.

The General Provisions require three additional types of reports. First, there are notification requirements which would enable the Agency to keep abreast of facilities subject to the standards of performance. Second, there would be reporting of performance test results which would show that a facility is meeting the standards initially. Third, there would be quarterly reports of excess emissions which would be quarterly reports of excess emissions which would permit the Agency to determine whether the emission control system installed to comply with the standards is being properly operated and maintained.

The resources needed by the industry to maintain records and to collect, prepare, and use the reporting through the first five years after proposal of the standard would be about 26 man-years.

Public Hearing

A public hearing will be held to discuss the proposed standards in accordance with Section 307(d)(5) of the Clean Air Act. Persons wishing to make oral presentations should contact EPA at the address given in the ADDRESSES section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement before, during, or within 30 days after the hearing. Written statements should be addressed to the Central Docket Section address given in the ADDRESSES section of this preamble.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Central Docket Section in Washington, D.C. (see ADDRESSES section of this preamble).

Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered in the development of this proposed rulemaking. The principal purposes of the docket are (1) to allow interested parties to readily identify and locate documents so that they can intelligently and effectively participate in the rulemaking process, and (2) to serve as the record in case of judicial review.

Miscellaneous

As prescribed by Section 111, establishment of standards of performance for bulk gasoline terminals was preceded by the Administrator's determination (40 CFR 60.16, 44 FR 49222, dated August 21, 1979) that these sources contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. In accordance with Section 117 of the Act, publication of this proposal was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies. The Administrator will welcome comments on all aspects of the proposed regulation, including economic and technological issues, monitoring requirements, and proposed test methods.

It should be noted that standards of performance for new sources established under Section 111 of the Clean Air Act reflect:

> * * * application of the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated [Section 111(a)(1)].

Although there may be emission control technology available that can reduce emissions below those levels required to comply with standards of performance, this technology might not be selected as the basis of standards or performance due to costs associated with its use. Accordingly, standards of performance should not be viewed as the ultimate in achievable emission control. In fact, the Act requires (or has the potential for acquiring) the imposition of a more stringent emission standard in several situations.

For example, applicable costs do not necessarily play as prominent a role in determining the "lowest achievable emission rate" for new or modified sources locating in non-attainment areas; i.e., those areas where statutorily-mandated health and welfare standards are being violated. In this respect, Section 173 of the Act requires that new or modified sources constructed in an area where ambient pollutant concentrations exceed the National Ambient Air Quality Standards (NAAQS) must reduce emissions to the level that reflects the "lowest achievable emission rate" (LAER), as defined in Section 171(3), for such category of source. The statute defines LAER as that rate of emissions based on whichever of the following is more stringent:

(A) the most stringent emission limitation which is contained in the implementation plan of any State for such class of category of source, unless the owner or operator of the proposed source deomonstates that such limitations are not achievable, or

(B) the most stringent emission limitation which is achieved in practice by such class or category of source.

In no event may the emission rate exceed any applicable new source performance standard [Section 171(3)].

A similar situation may arise under the prevention of significant deterioration of air quality provisions of the Act (Part C). These provisions require that certain sources [referred to in Section 169(1)] employ "best available control technology" (BACT) as defined in Section 169(3) for all pollutants regulated under the Act. Best available control technology must be determined on a case-by-case basis, taking energy, environmental, and economic impacts and other costs into account. In no event may the application of BACT result in emissions of any pollutants which exceed the emissions allowed by any applicable standard established pursuant to Section 111 (or 112) of the Act.

In all events, State Implementation Plans (SIPs) approved or promulgated under Section 110 of the Act must provide for the attainment and maintenance of NAAQS designed to protect public health and welfare. For this purpose, SIPs may in some cases require greater emission reductions than those required by standards of performance for new sources.

Finally, States are free under Section 116 of the Act to establish even more stringent emission limits than those established under Section 111 or those necessary to attain or maintain the NAAQS under Section 110. Accordingly, new sources may in some cases be subject to limitations more stringent than standards of performance under Section 111, and prospective owners and operators of new sources should be aware of this possibility in planning for such facilities.

This regulation will be reviewed four years from the date of promulgation as required by the Clean Air Act. This review will include an assessment of such factors as the need for integration with other programs, the existence of alternative methods, enforceability, improvements in emission control technology, and reporting requirements. The reporting requirements in this regulation will be reviewed as required under EPA's sunset policy for reporting requirements in regulations.

Section 317 of the Clean Air Act requires the Administrator to prepare an economic impact assessment for any new source standard of performance promulgated under Section 111(b) of the Act. An economic impact assessment was prepared for the proposed regulations and for other regulatory alternatives. All aspects of the assessment were considered in the formulation of the proposed standards to ensure that the proposed standards would represent the best system of emission reduction considering costs. The economic impact assessment is included in the Background Information Document.

Dated: December 8, 1980.

Douglas M. Costle,

Administrator.

It is proposed that 40 CFR Part 60 be amended as follows:

1. By adding a new subpart as follows:

Subpart XX—Standards of Performance for Bulk Gasoline Terminals

Sec.

60.500 Applicability and designation of affected facility.
60.501 Defintions.
60.502 Standards for volatile organic compound emissions from bulk gasoline terminals.
60.503 Test methods and procedures.
60.504 Monitoring of operations.
60.505 Recordkeeping.

Authority: Sections 111 and 301(a) of the Clean Air Act, as amended, (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

Subpart XX—Standards of Performance for Bulk Gasoline Terminals

§ 60.500 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is the total of all the loading racks at a bulk gasoline terminal which deliver liquid product into gasoline tank trucks.

(b) Each facility under paragraph (a) of this section that commences construction or modification after —— (date of publication in **Federal Register**

is subject to the provisions of this subpart.

(c) The provisions of § 60.504 will not apply until EPA has established and promulgated performance specifications for the monitoring devices. After the promulgation of performance specifications, these provisions will apply to each affected facility under paragraph (b) of this section.

§ 60.501 Definitions.

The terms used in this subpart are defined in the Clean Air Act, in § 60.2 of this part, or in this section as follows:

"Bulk gasoline terminal" means any wholesale gasoline outlet which receives gasoline by pipeline, ship, or barge.

"Continuous vapor processing system" means a VOC vapor processing system that treats VOC vapors collected from gasoline tank trucks on a demand basis without intermediate accumulation in a vapor holder.

"Gasoline" means any petroleum distillate or petroleum distillate/alcohol blend having a Reid vapor pressure of 27.6 kilopascals or greater which is used as a fuel for internal combustion engines.

"Gasoline tank truck" means a delivery tank truck used at bulk gasoline terminals which is loading gasoline or which has loaded gasoline on the immediately previous load.

"Intermittent vapor processing system" means a VOC vapor processing system that employs an intermediate vapor holder to accumulate the collected vapors from gasoline tank trucks, and treats the accumulated vapors only during automatically controlled cycles.

"Loading rack" means the loading arms, pumps, meters, shutoff valves, relief valves, check valves, electrical grounding, and lighting necessary to fill delivery tank trucks.

"Vapor collection system" means any equipment used for containing VOC vapors displaced during the loading of gasoline tank trucks.

"Vapor processing system" means any equipment used for recovering or oxidizing VOC vapors.

"Vapor-tight gasoline tank truck" means a gasoline tank truck which has demonstrated within the 12 preceding months that its product delivery tank will sustain a pressure change of not more than 750 pascals (75 mm of water) within 5 minutes after it is pressurized to 4,500 pascals (450 mm of water). This capability is to be demonstrated using the pressure test procedure specified in Reference Method 27.

"Volatile organic compound (VOC)" means any organic compound which participates in atmospheric photochemical reactions; or which is measured by Reference Methods 25A, 25B, and 21.

§ 60.502 Standard for Volatile Organic Compound (VOC) emissions from bulk gasoline terminals.

On and after the date on which the performance test required under by § 60.8 is completed, the owner or operator of a bulk gasoline terminal containing an affected facility shall comply with the requirements of this section.

(a) Each loading rack which loads gasoline tank trucks shall be equipped with a vapor collection system designed to collect the VOC vapors displaced from tank truck vapor collection systems during loading.

(b) The bulk gasoline terminal's vapor collection system shall be designed to prevent any VOC vapors collected at one loading rack from passing to another loading rack.

(c) The emissions to the atmosphere from the bulk gasoline terminal's vapor collection system due to the loading of liquid product into gasoline tank trucks are not to exceed 35 milligrams of VOC per liter of gasoline loaded.

(d) Loadings of liquid product into gasoline tank trucks shall be restricted to vapor-tight gasoline tank trucks only.

(e) Loadings of liquid product into gasoline tank trucks shall be restricted to those equipped with vapor recovery equipment that is compatible with the bulk gasoline terminal's vapor collection system.

(f) The bulk gasoline terminal's and the tank truck's vapor collection systems shall be connected during each loading of a gasoline tank truck.

(g) The vapor collection and liquid loading equipment shall be designed and operated to prevent gauge pressure in the delivery tank from exceeding 4,500 pascals (450 mm of water). This level is not to be exceeded when measured by the procedures specified in § 60.503(b).

(h) No pressure-vacuum vent in the bulk gasoline terminal's vapor collection system shall begin to open at a system pressure less than 4,500 pascals (450 mm of water).

(i) Each calendar month, the vapor collection system, the vapor processing system, and each loading rack handling gasoline shall be visually inspected during the loading of gasoline tank trucks for liquid or vapor VOC leaks. Each detection of a leak shall be recorded and the source of the leak repaired within 15 calendar days after it is detected. A summary of each set of three consecutive inspection records shall be submitted with the next quarterly report required under § 60.7(c).

§ 60.503 Test methods and procedures.

(a) For the performance tests, § 60.8(f) does not apply.

(b) For the purpose of determining compliance with the pressure regulation of § 60.502(g), the following procedures shall be used:

(1) Calibrate and install a liquid manometer, or equivalent, capable of measuring up to 500 mm of water gauge pressure with ±2.5 mm of water precision.

(2) Connect the manometer to a pressure tap in the terminal's vapor collection system, located as close as possible to the connection with the delivery tank.

(3) During the performance test, read and record the pressure every 5 minutes while a delivery tank is being loaded.

(c) For the purpose of determining compliance with the VOC mass emission limitation of § 60.502(c), the following reference methods shall be used:

(1) For the determination of volume at the exhaust vent:

(i) Method 2B for combustion vapor processing systems.

(ii) Method 2A for all other vapor processing systems.

(2) For the determination of VOC concentration at the exhaust vent, Method 25A or 25B. The calibration gas shall be either propane or butane.

(d) Immediately prior to a performance test required for determination of compliance with § 60.502(c) and (g), all potential sources of vapor leakage in the terminal's vapor collection system equipment shall be monitored for leaks using Method 21. A reading of greater than or equal to 10,000 ppmv as methane shall be considered a leak. All leaks shall be repaired prior to conducting the performance test.

(e) The test procedure for determining compliance with § 60.502(c) and (g) is as follows:

(1) The time period for a performance test shall be as follows:

(i) For continuous vapor processing systems, not less than 6 hours, during which at least 300,000 liters of gasoline are loaded.

(ii) For intermittent vapor processing systems, not less than 6 hours, during which at least 300,000 liters of gasoline are loaded and at least two full cycles of operation of the vapor processing system occur. The end of the performance test shall coincide with the end of a cycle of operation.

(2) All testing equipment shall be prepared and installed as specified in the appropriate test methods.

(3) For intermittent vapor processing systems, the system shall be manually started and allowed to process vapors

already in the vapor holder until the lower automatic cutoff is reached. This should be done immediately prior to the beginning of testing.

(4) An emission testing interval during the performance test shall consist of each 5 minute period or increment thereof, while the vapor processing system is operating; and each 15 minute period or increment thereof, while the vapor processing system is not operating.

(5) For each testing interval:

(i) The reading from each measurement instrument shall be recorded, and

(ii) The volume exhausted and the average VOC concentration in the exhaust vent, as specified in the appropriate test method, shall be determined.

(6) The volume of gasoline dispensed during the performance test period at all loading racks whose vapor emissions are controlled by the processing system being tested shall be determined. This may be determined from terminal records or from gasoline dispensing meters at each loading rack.

(7) The mass emitted for each testing interval shall be calculated as follows:

$M_e = 10^{-6} K V_{es} C_e$

where:

M_e = mass of VOC emitted at the exhaust vent, mg.

V_{es} = volume of air-vapor mixture exhausted, m^3 at standard conditions.

C_e = VOC concentration (as measured) at the exhaust vent, ppmv.

K = density of calibration gas, mg/m^3, at standard conditions
$= 1.83 \times 10^6$ for propane
$= 2.41 \times 10^6$ for butane.

s = standard conditions, 20°C and 760 mm Hg.

(8) The VOC emissions shall be calculated as follows:

$$E = \frac{\sum_{i}^{n} M_{ei}}{L}$$

where:

E = mass of VOC emitted per volume of gasoline loaded, mg/l.

L = total volume of gasoline loaded, l.

M_{ei} = mass of VOC emitted for each testing interval i, mg.

n = number of testing intervals.

(f) The owner or operator may adjust the emission results to exclude the methane and ethane content in the exhaust vent by any method approved by the Administrator.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.504 Monitoring of operations.

(a) The owner or operator of each affected facility shall install, calibrate, operate, and maintain a monitoring system to continuously measure the VOC concentration of the exhaust vent stream of the vapor processing system to determine the proper operation of each system.

(b) Upon application to the Administrator, monitoring of a vapor processing system process parameter may be substituted for the measurement of the exhaust vent VOC content, if it can be demonstrated to the Administrator's satisfaction that the value of the process parameter is indicative of proper operation of the system and is related to the exhaust vent VOC content. Monitoring of process parameters must be approved on a case-by-case basis by the Administrator.

(c) Each monitoring device shall be installed, calibrated, operated, and maintained according to accepted practices and the manufacturer's specifications.

(d) The VOC concentration monitoring device shall be installed in a location that is representative of the VOC concentration in the exhaust vent, at least two equivalent stack diameters from the exhaust point, and protected from any interferences due to wind, weather, or other processes.

(e) Each monitoring device shall be equipped with a recording device so that a permanent time record of the measured process parameter is produced.

(f) The exhaust vent VOC concentration or approved process parameter shall be continuously measured and recorded during the performance test required under § 60.8.

(g) For the purposes of reports required under § 60.7(c), periods of excess emissions are defined as any 6-hour clock periods during which the average value of the exhaust vent VOC concentration or measured process parameter, during periods of vapor processing system operation, differs from the average value measured during the performance test required under § 60.8.

(h) The owner or operator of each affected facility shall install and operate all monitoring equipment before conducting the performance test required under § 60.8.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

§ 60.505 Recordkeeping.

(a) The owner or operator of each bulk gasoline terminal containing an affected facility shall keep on file documentation that each gasoline tank truck loading at that terminal is a vapor-tight gasoline tank truck. This documentation shall be kept on file at the terminal in a permanent form available for inspection.

(b) The documentation file for each gasoline tank truck shall be updated at least once per year to reflect current test results as determined by Method 27. This documentation shall include, as a minimum, the following information:

(1) Test Short Title: Gasoline Delivery Tank Pressure Test—EPA Test Method 27.

(2) Tank Owner and Address.

(3) Tank ID Number.

(4) Testing Location.

(5) Date of Test.

(6) Tester Name and Signature.

(7) Witnessing Inspector, if any: Name, Signature, and Affiliation.

(8) Test Results: Actual Pressure Change in 5 minutes, mm of water (average for 2 runs).

(c) The owner or operator of each bulk gasoline terminal containing an affected facility shall keep on file at the terminal a record of each monthly leak inspection required under § 60.502(i). Inspection records shall include, as a minimum, the following information:

(1) Date of Inspection.

(2) Findings (may indicate no leaks discovered; or location, nature, and severity of each leak).

(3) Corrective Action (date each leak repaired; reasons for any repair interval in excess of 15 days).

(4) Inspector Name and Signature.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414))

2. By adding five new Reference Methods (Method 2A, Method 2B, Method 25A, Method 25B, and Method 27) to Appendix A as follows:

Appendix A—Reference Methods

* * * * *

Method 2A. Direct Measurement of Gas Volume Through Pipes and Small Ducts

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of gas flow rates in pipes and small ducts, either in-line or at exhaust positions, within the temperature range of 0 to 50°C.

1.2 Principle. A gas volume meter is used to directly measure gas volume. Temperature

and pressure measurements are made to correct the volume to standard conditions.

2. *Apparatus*

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

2.1 Gas Volume Meter. A positive displacement meter, turbine meter, or other direct volume measuring device capable of measuring volume to within 2 percent. the meter shall be equipped with a temperature gauge (±2 percent of the minimum absolute temperature) and a pressure gauge (±2.5 mm Hg). The manufacturer's recommended capacity of the meter shall be sufficient for the expected maximum and minimum flow rates at the sampling conditions. Temperature, pressure, corrosive characteristics, and pipe size are factors necessary to consider in choosing a suitable gas meter.

2.2 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg. In many cases, the barometric reading may be obtained from a nearby national weather service station. in which case the station value (which is the absolute barometric pressure) shall be requested, and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm Hg per 30-meter elevation increase, or vice-versa for elevation decrease.

2.3 Stopwatch. Capable of measurement to within 1 second.

3. *Procedure*

3.1 Installation. As there are numerous types of pipes and small ducts that may be subject to volume measurement, it would be difficult to describe all possible installation schemes. In general, flange fittings should be used for all connections wherever possible. Gaskets or other seal materials should be used to assure leak-tight connections. The volume meter should be located so as to avoid severe vibrations and other factors that may affect the meter calibration.

3.2 Leak Test. A volume meter installed at a location under positive pressure may be leak-checked at the meter connections by using a liquid leak detector solution containing a surfactant. Apply a small amount of the solution to the connections. If a leak exists, bubbles will form, and the leak must be corrected.

A volume meter installed at a location under negative pressure is very difficult to test for leaks without blocking flow at the inlet of the line and watching for meter movement. If this procedure is not possible, visually check all connections and assure tight seals.

3.3 Volume Measurement.

3.3.1 For sources with continuous, steady emission flow rates, record the initial meter volume reading, meter temperature(s), meter pressure, and start the stopwatch. Throughout the test period, record the meter temperature(s) and pressure so that average values can be determined. At the end of the test, stop the timer and record the elapsed time, the final volume reading, meter temperature(s), and pressure. Record the barometric pressure at the beginning and end of the test run. Record the data on a table similar to Figure 2A–1.

3.3.2 For sources with noncontinuous, non-steady emission flow rates, use the procedure in 3.3.1 with the addition of the following. Record all the meter parameters and the start and stop times corresponding to each process cyclical or noncontinuous event.

4. *Calibration*

4.1 Volume Meter. The volume meter is calibrated against a standard reference meter prior to its initial use in the field. The reference meter is a spirometer or liquid displacement meter with a capacity consistent with that of the test meter. Alternative references may be used upon approval of the Administrator.

Set up the test meter in a configuration similar to that used in the field installation (i.e., in relation to the flow moving device). Connect the temperature and pressure gauges as they are to be used in the field. Connect the reference meter at the inlet of the flow line, if appropriate for the meter, and begin gas flow through the system to condition the meters. During this conditioning operation, check the system for leaks.

BILLING CODE 6560-26-M

Plant _____

Date _____ Run Number _____

Sample Location _____

Barometric Pressure mm Hg Start _____ Finish _____

Operators _____

Meter Number _____ Meter Calibration Coefficient _____

Last Date Calibrated _____

Time	Volume	Static pressure	Temperature		
Run/clock	Meter reading	mm Hg	°C	°K	
Average					

Figure 2A-1. Volume flow rate measurement data.

BILLING CODE 6560-26-C

The calibration shall be run over at least three different flow rates. The calibration flow rates shall be about 0.3, 0.6, and 0.9 times the meter's rated maximum flow rate.

For each calibration run, the data to be collected include: reference meter initial and final volume readings, the test meter initial and final volume reading, meter average temperature and pressure, barometric pressure, and run time. Repeat the runs at each flow rate at least three times.

Calculate the test meter calibration coefficient, Y_m, for each run as follows:

$$Y_m = \frac{(V_{rf} - V_{ri})(t_r + 273)}{(V_{mf} - V_{mi})(t_m + 273)} \frac{P_b}{(P_b + P_g)} \qquad \text{Eq. 2A-1}$$

Where:

Y_m = Test volume meter calibration coefficient, dimensionless.
V_r = Reference meter volume reading, m^3.
V_m = Test meter volume reading, m^3.
t_r = Reference meter average temperature, °C.
t_m = Test meter average temperature, °C.
P_b = Barometric pressure, mm Hg.
P_g = Test meter average static pressure, mm Hg.
f = Final reading for run.
i = Initial reading for run.

Compare the three Y_m values at each of the flow rates tested and determine the maximum and minimum values. The difference between the maximum and minimum values at each flow rate should be no greater than 0.030. Extra runs may be required to complete this requirement. If this specification cannot be met in six successive runs, the test meter is not suitable for use. In addition, the meter coefficients should be between 0.95 and 1.05. If these specifications are met at all the flow rates, average all the Y_m values for an average meter calibration coefficient, $\overline{Y}_m$.

The procedure above shall be performed at least once for each volume meter. Therefore, an abbreviated calibration check shall be completed after each field test. The calibration of the volume meter shall be checked by performing three calibration runs at a single, intermediate flow rate (based on the previous field test) with the meter pressure set at the average value encountered in the field test. Calculate the average value of the calibration factor. If the calibration has changed by more than 5 percent, recalibrate the meter over the full range of flow as described above. Note: If the volume meter calibration coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the greater value of pollutant emission rate.

4.2 Temperature Gauge. After each test series, check the temperature gauge at ambient temperature. Use an ASTM mercury-in-glass reference thermometer, or equivalent, as a reference. If the gauge being checked agrees within 2 percent (absolute temperature) of the reference, the temperature data collected in the field shall be considered valid. Otherwise, the test data shall be considered invalid or adjustments of the test results shall be made, subject to the approval of the Administrator.

4.3 Barometer. Calibrate the barometer used against a mercury barometer prior to the field test.

5. *Calculations*

Carry out the calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

5.1 Nomenclature.

P_b = Barometric pressure, mm Hg.
P_g = Average static pressure in volume meter, mm Hg.
Q_s = Gas flow rate, m^3/min, standard conditions.
T_m = Average absolute meter temperature, °K.
V_m = Meter volume reading, m^3.
$\overline{Y}_m$ = Meter calibration coefficient, dimensionless.
f = Final reading for run.
i = Initial reading for run.
s = Standard conditions, 20° C and 760 mm Hg.
θ = Elapsed run time, min.

5.2 Volume.

$$V_{ms} = 0.3853\, \overline{Y}_m\, (V_{mf} - V_{mi})\, \left(\frac{P_b + P_g}{T_m}\right) \qquad \text{Eq. 2A-2}$$

5.3 Gas Flow Rate.

$$Q_s = \frac{V_{ms}}{\theta} \qquad \text{Eq. 2A-3}$$

6. *References*

6.1 United States Environmental Protection Agency. Standards of Performance for New Stationary Sources, Revisions to Methods 1–8. Title 40, part 60. Washington, D.C. Federal Register Vol. 42, No. 160. August 18, 1977.

6.2 Rom, Jerome J. Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment, U.S. Environmental Protection Agency. Research Triangle Park, N.C. Publication No. APTD–0576. March 1972.

6.3 Wortman, Martin, R. Vollaro, and P. R. Westlin. Dry Gas Volume Meter Calibrations. Source Evaluation Society Newsletter. Vol. 2, No. 2. May 1977.

6.4 Westlin, P. R. and R. T. Shigehara. Procedure for Calibrating and Using Dry Gas Volume Meters as Calibration Standards. Source Evaluation Society Newsletter. Vol. 3, No. 1. February 1978.

Method 2B—Determination of Exhaust Gas Volume Flow Rate From Gasoline Vapor Incinerators

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of exhaust volume flow rate from incinerators that process gasoline vapors consisting of generally non-methane alkanes, alkenes, and/or arenes (aromatic hydrocarbons). It is assumed that the amount of auxiliary fuel is negligible.

1.2 Principle. The incinerator exhaust flow rate is determined by carbon balance. Organic carbon concentration and volume flow rate are measured at the incinerator inlet. Organic carbon, carbon dioxide (CO_2), and carbon monoxide (CO) concentrations are measured at the outlet. Then the ratio of total carbon at the incenerator inlet and outlet is multiplied by the inlet volume to determine the exhaust volume and volume flow rate.

2. *Apparatus*

2.1 Volume Meter. Equipment described in Method 2A.

2.2 Organic Analyzers (2). Equipment described in Method 25A or 25B.

2.3 CO Analyzer. Equipment described in Method 10.

2.4 CO_2 Analyzer. A nondispersive infrared (NDIR) CO_2 analyzer and supporting equipment described in Method 10.

3. *Procedure*

3.1 Inlet Installation. Install a volume meter in the vapor line to incinerator inlet according to the procedure in Method 2A. At the volume meter inlet, install a sample probe as described in Method 25A. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the vapor line cross-section. Connect to the probe a leak-tight, heated (if necessary to prevent condensation) sample line (stainless steel or equivalent) and an organic analyzer system as described in Method 25A or 25B.

3.2 Exhaust Installation. Three analyzers are required for the incinerator exhaust—CO_2, CO, and organic. A sample manifold with a single sample probe may be used. Install a sample probe as described Method 25A or, alternatively, a single opening probe positioned so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section. Connect a leak-tight heated sample line to the sample probe. Heat the sample line sufficiently to prevent any condensation.

3.3 Recording Requirements. The output of each analyzer must be permanently recorded on an analog strip chart, digital recorder, or other recording device. The chart speed or number of readings per time unit must be similar for all analyzers so that data can be correlated. The minimum data recording requirement for each analyzer is one measurement value per minute during the incinerator test period.

3.4 Preparation. Prepare and calibrate all equipment and analyzers according to the procedures in the respective methods. All calibration gases must be introduced at the connection between the probe and the sample line. If a manifold system is used for the exhaust analyzers, all the analyzers and sample pumps must be operating when the calibrations are done. Note: For the purposes of this test, methane should not be used as an organic calibration gas.

3.5 Sampling. At the beginning of the test period, record the initial parameters for the inlet volume meter according to the procedures in Method 2A and mark all of the recorder strip charts to indicate the start of the test. Continue recording inlet organic and exhaust CO_2, CO, and organic concentrations throughout the test. During periods of process interruption and halting of gas flow, stop the timer and mark the recorder strip charts so that data from this interruption are not included in the calculations. At the end of the test period, record the final parameters for the inlet volume meter and mark the end on all of the recorder strip charts.

3.6 Post Test Calibrations. At the conclusion of the sampling period, introduce the calibration gases as specified in the respective reference methods. If analyzer output does not meet the specifications of the method, invalidate the test data for that period. Alternatively, calculate the volume results using initial calibration data and using final calibration data and report both resulting volumes. Then, for emissions calculations, use the volume measurement resulting in the greatest emission rate concentration.

4. *Calculations*

Carry out the calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

4.1 Nomenclature

CO_e—Mean carbon monoxide concentration in system exhaust, ppmv.

CO_{2e}—Mean carbon dioxide concentration in system exhaust, ppmv.

HC_e—Mean organic concentration in system exhaust as defined by the calibration gas, ppmv.

HC_i—Mean organic concentration in system inlet as defined by the calibration gas, ppmv.

K—Calibration gas factor=2 for ethane calibration gas.
=3 for propane calibration gas.
=4 for butane calibration gas.

V_{es}—Exhaust gas volume, m^3.

V_{is}—Inlet gas volume, m^3.

Q_{es}—Exhaust gas volume flow rate, m^3/min.

Q_{is}—Inlet gas volume flow rate, m^3/min.

θ—Sample run time, min.

s—Standard Conditions: 20°C, 760 mm Hg.

300—Estimated concentration of ambient CO_2, ppmv. (CO_2 concentration in the ambient air may be measured during the test period using an NDIR and the mean value substituted into the equation.)

4.2 Concentrations. Determine mean concentrations of inlet organics, outlet CO_2, CO, and outlet organics according to the procedures in the respective methods and the analyzers' calibration curves, and for the time intervals specified in the applicable regulations. Concentrations should be determined on a parts per million by volume (ppmv) basis.

4.3 Exhaust Gas Volume. Calculate the exhaust gas volume as follows:

$$V_{es} = V_{is} \frac{K(HC_i)}{K(HC_e) + CO_{2e} + CO_e - 300} \qquad \text{Eq. 2B-1}$$

4.4 Exhaust Gas Volume Flow Rate. Calculate the exhaust gas volume flow rate as follows:

$$Q_{es} = \frac{V_{es}}{\theta} \qquad \text{Eq. 2B-2}$$

5. *References*

5.1 Measurement of Volatile Organic Compounds. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, N.C. 27711. Publication No. EPA–450/2–78–041. October 1978. p. 55.

5.2 Method 10—Determination of Carbon Monoxide Emissions from Stationary Sources. U.S. Environmental Protection Agency. Code of Federal Regulations. Title 40, Chapter 1, part 60, Appendix A. Washington, D.C. Office of the Federal Register. March 8, 1974.

5.3 Method 2A—Determination of Gas Flow Rate in Pipes and Small Ducts. Tentative Method. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, N.C. 27711. March 1980.

5.4 25A—Determination of Total Gaseous Organic Compounds Using a Flame Ionization Analyzer. Tentative Method. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, N.C. 27711. March 1980.

5.5 Method 25B—Determination of Total Gaseous Organic Compounds Using a Nondispersive Infrared Analyzer. Tentative Method. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, N.C. 27711. March 1980.

Method 25A—Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting of nonmethane alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic compound) or in terms of organic carbon.

1.2 Principle. A gas sample is extracted from the source, through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as concentration equivalents of the calibration gas organic constituent, carbon, or other organic compound.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system output readings before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place and the input concentration at the time of the measurements were zero.

2.5 Calibration Drift. The difference in the measurement system output readings before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place and the input concentration at the time of the measurements was a mid-level value.

3. *Apparatus*

A schematic of an acceptable measurement system is known in Figure 25A–1. The essential components of the measurement system are described below:

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter.

3.3 Sample Line. Stainless steel or Teflon[1] tubing to transport the sample gas to the analyzers. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders of stainless steel or aluminum. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Reference 9.2. The pressure in the gas cylinders is limited by the critical pressure of the subject organic component. As a safety factor, the maximum pressure in the cylinder should be no more than half the critical pressure. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value.

Calibration gas usually consists of propane in air or nitrogen and is determined in terms of the span value. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the highest expected concentration. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for carbon number.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume of organic material (propane or carbon equivalent).

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ± 1 percent of the span value.

5.2 Calibration Drift. Less than ± 1 percent of the span value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall not be located within 1.5 meters or 2 equivalent diameters (whichever is less) of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration. Immediately prior to the test series, introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for all four gases and develop a permanent record of the calibration curve. This curve shall be used in performing the post-test drift checks and in reducing all measurement data during the test series. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

7. *Emission Measurement Test Procedure*

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time notations and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period, or

[1] Mention of trade names on specific products does not constitute endorsement by the Environmental Protection Agency.

if adjustments are necessary for the measurement system during the test, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after the drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test run preceding the check and repeat the test run following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using the calibration data that yield the highest corrected emission concentration.

8. *Organic Concentration Calculations*

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A–1.

$C_c = K C_{meas}$ Eq. 25A–1

Where:

C_c = Organic concentration as carbon, ppmv.
C_{meas} = Organic concentration as measured, ppmv.
K = Carbon equivalent correction factor,
K = 2 for ethane.
K = 3 for propane.
K = 4 for butane.

9. *References*

9.1 Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, N.C. Publication No. EPA–450/2–78–041. June 1978. p. 46–54.

9.2 Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, N.C. June 1978. 10 pgs.

9.3 Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, N.C. Report No. 75–GAS–6. August 1975. 32 pgs.

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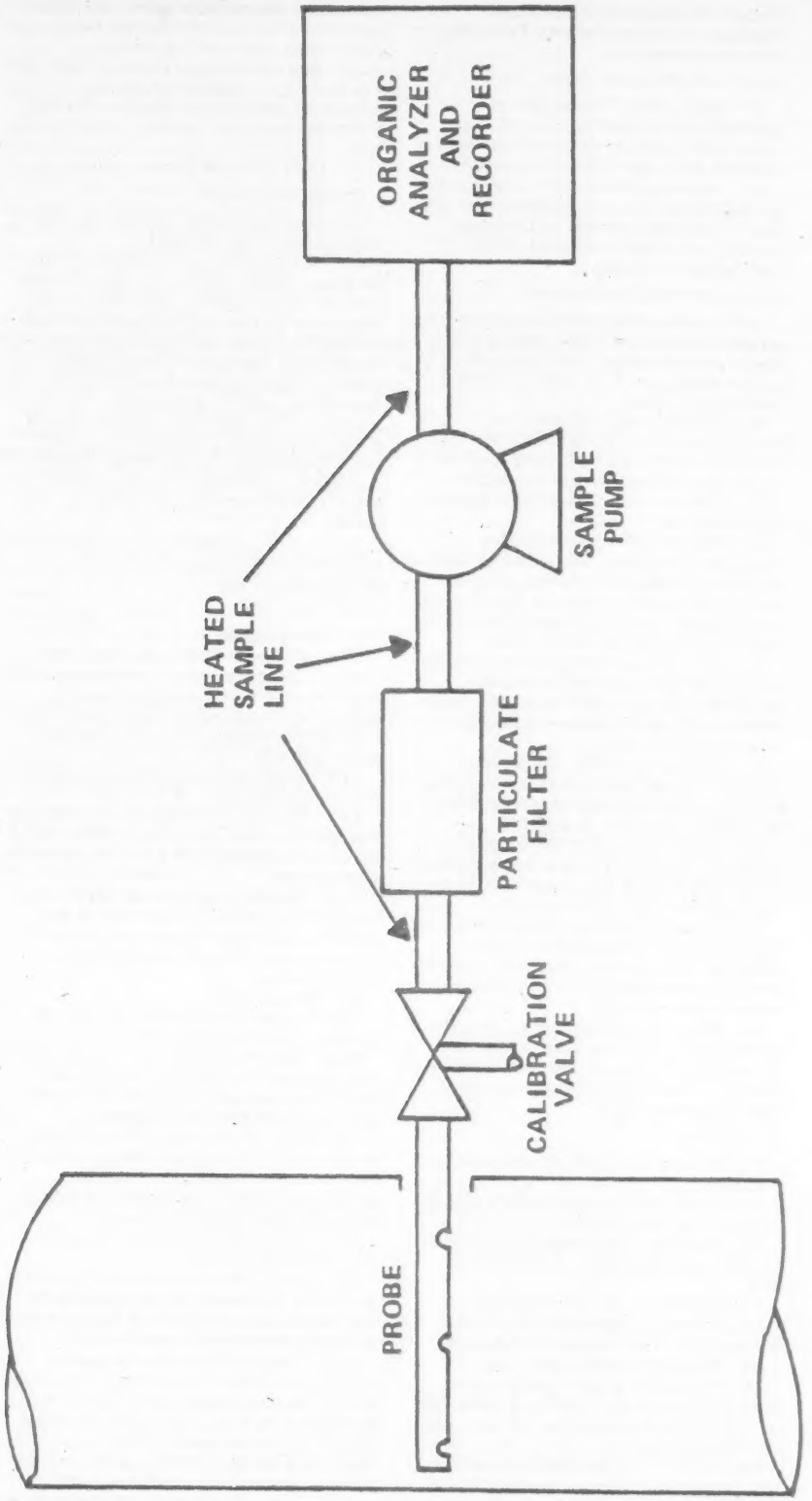

Figure 25A-1. Organic Concentration Measurement System.

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Method 25B—Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of Total gaseous organic concentration of vapors consisting primarily of nonmethane alkanes. (Other organic materials may be measured using the general procedure in this method, the appropriate calibration gas, and an analyzer set to the appropriate absorption band.) The concentration is expressed in terms of propane (or other calibration gas) or in terms of organic carbon.

1.2 Principle. A gas sample is extracted from the source, through a heated sample line and glass fiber filter to a nondispersive infrared analyzer (NDIR). Results are reported as equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

The terms and definitions are the same as for Method 25A.

3. *Apparatus*

The apparatus are the same as for Method 25A with the exception of the following:

3.1 Organic Concentration Analyzer. A nondispersive infrared analyzer designed to measure alkane organics and capable of meeting or exceeding the specifications in this method.

4. *Calibration Gases*

The calibration gases are the same as are required for Method 25A, Section 4. No fuel gas is required for an NDIR.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ± 2 percent of the span value.

5.2 Calibration Drift. Less than ± 2 percent of the span value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. Same as in Method 25A, Section 6.1.

6.2 Location of Sample Probe. Same as in Method 25A, Section 6.2.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

6.4 Calibration. Same as in Method 25A, Section 6.4.

7. *Emission Measurement Test Procedure*

Proceed with the emission measurement immediately upon satisfactory completion of the calibration.

7.1 Organic Measurement. Same as in Method 25A, Section 7.1.

7.2 Drift Determination. Same as in Method 25A, Section 7.2.

8. *Organic Concentration Calculations*

The calculations are the same as in Method 25A, Section 8.

9. *References*

The references are the same as in Method 25A, Section 9.

Method 27—Determination of Vapor Tightness of Gasoline Delivery Tank Using Pressure-Vacuum Test

1. *Applicability and Principle*

1.1 Applicability. This method is applicable for the determination of vapor tightness of a gasoline delivery tank which is equipped with vapor collection equipment.

1.2 Principle. Pressure and vacuum are applied alternately to the compartments of a gasoline delivery tank and the change in pressure or vacuum is recorded after a specified period of time.

2. *Definitions and Nomenclature*

2.1 Gasoline. Any petroleum distillate or petroleum distillate/alcohol blend having a Reid Vapor pressure of 27.6 kilopascals or greater which is used as a fuel for internal combustion engines.

2.2 Delivery tank. Any container, including associated pipes and fittings, that is attached to or forms a part of any truck or railcar used for the transport of gasoline.

2.3 Compartment. A liquid-tight division of a delivery tank.

2.4 Delivery tank vapor collection equipment. Any piping, hoses, and devices on the delivery tank used to collect and route gasoline vapors either from the tank to a bulk terminal vapor control system or from a bulk plant or service station into the tank.

2.5 Time period of the pressure or vacuum test (t). The time period of the test, as specified in the appropriate regulation, during which the change in pressure of vacuum is monitored, in minutes.

2.6 Initial pressure (P_i). The pressure applied to the delivery tank at the beginning of the static pressure test, as specified in the appropriate regulation, in mm H_2O.

2.7 Initial vacuum (V_i). The vacuum applied to the delivery tank at the beginning of the static vacuum test, as specified in the appropriate regulation, in mm H_2O.

2.8 Allowable pressure change (Δp). The allowable amount of decrease in pressure during the static pressure test, within the time period t, as specified in the appropriate regulation, in mm H_2O.

2.9 Allowable vacuum change (Δv). The allowable amount of increase in vacuum during the static vacuum test, within the time period t, as specified in the appropriate regulation, in mm H_2O.

3. *Apparatus*

3.1 Pressure source. Pump or compressed gas cylinder of air or inert gas sufficient to pressurize the delivery tank to 500 mm H_2O above atmospheric pressure.

3.2 Regulator. Low pressure regulator for controlling pressurization of the delivery tank.

3.3 Vacuum source. Vacuum pump capable of evacuating the delivery tank to 250 mm H_2O below atmospheric pressure.

3.4 Pressure-vacuum supply hose.

3.5 Manometer. Liquid manometer, or equivalent instrument, capable of measuring up to 500 mm H_2O gauge pressure with ±2.5 mm H_2O precision.

3.6 Pressure-vacuum relief valves. The test apparatus shall be equipped with an In-line pressure-vacuum relief valve set to activate at 675 mm H_2O above atmospheric pressure or 250 mm H_2O below atmospheric pressure, with a capacity equal to the pressurizing or evacuating pumps.

3.7 Test cap for vapor recovery hose. This cap shall have a tap for manometer connection and a fitting with shut-off valve for connection to the pressure-vacuum supply hose.

3.8 Caps for liquid delivery hoses.

4. *Pretest Preparations*

4.1 Emptying of tank. The delivery tank shall be emptied of all liquid.

4.2 Purging of vapor. The delivery tank shall be purged of all volatile vapors by any safe, acceptable method. One method is to carry a load of non-volatile liquid fuel, such as diesel or heating oil, immediately prior to the test, thus flushing out all the volatile gasoline vapors. A second method is to remove the volatile vapors by blowing ambient air into each tank compartment for at least 20 minutes. This second method is usually not as effective and often causes stabilization problems, requiring a much longer time for stabilization during the testing.

4.3 Location of test site. The delivery tank shall be tested where it will be protected from direct sunlight.

5. *Test Procedure*

5.1 Preparations.

5.1.1 Open and close each dome cover.

5.1.2 Connect static electrical ground connections to tank. Attach the liquid delivery and vapor return hoses, remove the liquid delivery elbows, and plug the liquid delivery fittings.

5.1.3 Attach the test cap to the end of the vapor recovery hose.

5.1.4 Connect the pressure-vacuum supply hose and the pressure-vacuum relief valve to the shut-off valve. Attach a manometer to the pressure tap.

5.1.5 Connect compartments of the tank internally to each other if possible. If not possible, each compartment must be tested separately, as if it were an individual delivery tank.

5.2 Pressure Test.

5.21 Connect the pressure source to the pressure-vacuum supply hose.

5.2.2 Open the shut-off valve in the vapor recovery hose cap. Applying air pressure slowly, pressurize the tank to P_i, the initial pressure specified in the regulation.

5.23 Close the shut-off valve and allow the pressure in the tank to stabilize, adjusting the pressure if necessary to maintain pressure of P_i. When the pressure stabilizes, record the time and initial pressure.

5.24 At the end of t minutes, record the time and final pressure.

5.25 Repeat steps 5.2.2 through 5.2.4 until the change in pressure for two consecutive runs agrees with ±10mm H_2O. Calculate the arithmetic average of the two results.

5.2.6 Compare the average measured change in pressure to the allowable pressure change, Δp, as specified in the regulation. If the delivery tank does not satisfy the vapor tightness criterion specified in the regulation, repair the sources of leakage, and repeat the pressure test until the criterion is met.

5.2.7 Disconnect the pressure source from the pressure-vacuum supply hose, and slowly

open the shut-off valve to bring the tank to atmospheric pressure.

5.3 Vacuum Test.

5.3.1 Connect the vacuum source to the pressure-vacuum supply hose.

5.3.2 Open the shut-off valve in the vapor recovery hose cap. Slowly evacuate the tank to V_i, the initial vacuum specified in the regulation.

5.3.3 Close the shut-off valve and allow the pressure in the tank to stabilize, adjusting the pressure if necessary to maintain a vacuum of V_i. When the pressure stabilizes, record the time and initial vacuum.

5.3.4 At the end of t minutes, record the time and final vacuum.

5.3.5 Repeat steps 5.3.2 through 5.3.4 until the change in vacuum for two consecutive runs agrees within ± 10 mm H_2O. Calculate the arithmetic average of the two results.

5.3.6 Compare the average measured change in vacuum to the allowable vacuum change, Δv, as specified in the regulation. If the delivery tank does not satisfy the vapor tightness criterion specified in the regulation, repair the sources of leakage, and repeat the vacuum test until the criterion is met.

5.3.7 Disconnect the vacuum source from the pressure-vacuum supply hose, and slowly open the shut-off valve to bring the tank to atmospheric pressure.

5.4 Post-test clean-up. Disconnect all test equipment and return the delivery tank to its pretest condition.

6. *Alternative Procedures*

Techniques other than specified above may be used for purging and pressurizing a delivery tank, if prior approval is obtained from the Administrator. Such approval will be based upon demonstrated equivalency with the above method.

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